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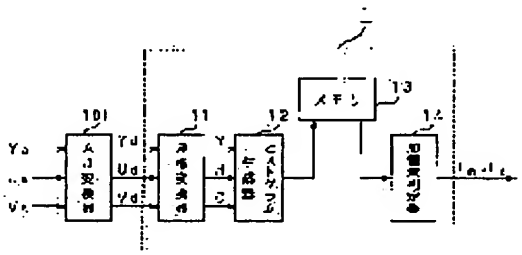
(54) IMAGE PROCESSOR

(57)Abstract:
PURPOSE: To provide an image processor which can speedily and accurately analyzes the skin color area of a person and detect the face area of the person.
CONSTITUTION: A converting means 11 converts illuminance data Ya and color difference data Ua and Va of digitized person image data into three attribute data which are illuminance data Y, hue data H, and chroma data C. A skin color pixel distribution generating means 12 extracts skin color pixels from the three attribute data obtained by the converting means 11 and generates a spatial skin color pixel distribution of the extracted skin color pixels. A face area deciding means 14 decides the face area of the person image by regarding an area where skin color pixels gathers closely as the skin color area according to the skin color pixel distribution generated by the skin color pixel distribution generating means 12.



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CLAIMS

[Claim(s)]
[Claim 1] It changes into the brightness data and color difference data which digitized the inputted portrait image data. It is the image processing system equipped with a skin field detection means to detect a skin field, from the digitized brightness data and color difference data. The above-mentioned skin field detection means A conversion means to change the above-mentioned brightness data and color difference data into 3 attribute data of brightness data, hue data, and chroma data, A beige pixel extract means to extract a beige pixel from 3 attribute data obtained by the above-mentioned conversion means, A beige pixel distribution generation means to generate spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means, The image processing system characterized by having a face field judging means to judge the face field of a portrait image by making into a beige field the field where a beige pixel crowds from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means.
[Claim 2] The above-mentioned beige pixel distribution generation means is an image processing system according to claim 1 characterized by generating the beige pixel distribution which is the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image.
[Claim 3] The above-mentioned beige pixel distribution generation means is an image processing system according to claim 1 characterized by generating the beige pixel distribution which is the beige pixel histogram of the perpendicularly the number of the beige pixels horizontally located in a line for every vertical position of the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image, and a portrait image was accumulated.
[Claim 4] The above-mentioned face field judging means is an image processing system according to claim 3 characterized by judging a face field by analyzing the ratio of beige area size and die length in every direction from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means.
[Claim 5] It has a perpendicular brightness change detection means to detect brightness change of the perpendicular direction in a beige field from the brightness data obtained by the above-mentioned conversion means. The above-mentioned beige pixel distribution generation means Brightness change distribution of brightness change of the perpendicular direction in the beige field detected by the above-mentioned perpendicular brightness change detection means while generating spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means is generated. The above-mentioned face field judging means is an image processing system according to claim 1 characterized by judging the face field of a portrait image from the beige pixel distribution and brightness change distribution which were generated by the above-mentioned beige pixel distribution generation means.
[Claim 6] It has a calculation means within a block to compute the average value for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned beige pixel extract means A beige block is extracted from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means It is the image processing system according to claim 1 which generates spatial beige block distribution of the beige block extracted by the above-mentioned beige pixel extract means, and is characterized by the above-mentioned face field judging means judging the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means.

[Claim 7] It has a calculation means within a block to compute the average value for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means, and the maximum of brightness change of a block which divided into the block brightness change detected by the above-mentioned perpendicular brightness change detection means. The above-mentioned beige pixel extract means A beige block is extracted from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means Spatial beige block distribution of the beige block extracted by the above-mentioned beige block extract means and brightness change distribution of the maximum of brightness change of the block computed by the above-mentioned calculation means within a block are generated. The above-mentioned face field judging means is an image processing system according to claim 5 characterized by judging the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means, and brightness change distribution.

[Claim 8] The image processing system of the publication by any 1 term of claims 1-7 carry out controlling the above-mentioned profile emphasis means based on the skin field information which was equipped with a profile emphasis means perform profile emphasis processing to the brightness data of the inputted portrait image data, and a delay means give the amount of delay corresponding to the time amount which the above-mentioned profile emphasis processing takes the color-difference data of the inputted portrait image data, and was detected by the above-mentioned skin field detection means as the description.

[Claim 9] A storage means to give and memorize the amount of delay corresponding to the time amount taken to detect skin field information for the portrait image data changed into brightness data and color difference data with the above-mentioned skin field detection means, A conversion means to change into 3 attribute data of brightness data, hue data, and chroma data the portrait image data memorized by the above-mentioned storage means, It has a detection means to detect beige data from 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned delay means The amount of delay corresponding to the time amount which the above-mentioned profile emphasis processing takes is given to the color difference data memorized by the above-mentioned storage means. The above-mentioned profile emphasis means The image processing system according to claim 8 characterized by performing profile emphasis processing to the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information detected by the above-mentioned skin field detection means.

[Claim 10] A scene change detection means to detect the change of a scene from the inputted portrait image data, It has a smoothing means to graduate in time the spatial location of the skin field information detected by the above-mentioned skin field detection means only when the same scene continued based on the detection result of the above-mentioned scene change detection means. The above-mentioned profile emphasis means is an image processing system according to claim 8 characterized by performing profile emphasis processing to the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information from the above-mentioned smoothing means.

[Claim 11] The image processing system according to claim 1 to 7 characterized by to control the above-mentioned gray-scale-conversion means based on the skin field information which was equipped with a delay means give the amount of delay corresponding to the time amount which takes the color-difference data of the portrait image data inputted as a gray-scale-conversion means change the gradation property of the brightness data of the inputted portrait image data to change a gradation property with the above-mentioned gray-scale-conversion means, and was detected by the above-mentioned skin field detection means.

[Claim 12] A storage means to give and memorize the amount of delay corresponding to the time amount taken to detect skin field information for the portrait image data changed into brightness data and color difference data with the above-mentioned skin field detection means, A conversion means to change into 3 attribute data of brightness data, hue data, and chroma data the portrait image data memorized by the above-mentioned storage means, It has a detection means to detect beige data from 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned delay means The amount of delay corresponding to the time amount taken to change a gradation property into the color difference data memorized by the above-mentioned storage means with the above-mentioned gray-scale-conversion means is given. The above-mentioned gray-scale-conversion means The image processing system according to claim 11 characterized by changing the gradation property of the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means

by the control based on the skin field information detected by the above-mentioned skin field detection means.

[Claim 13] A scene change detection means to detect the change of a scene from the inputted portrait image data, It has a smoothing means to graduate in time the spatial location of the skin field information detected by the above-mentioned skin field detection means only when the same scene continued based on the detection result of the above-mentioned scene change detection means. The above-mentioned gray-scale-conversion means is an image processing system according to claim 11 characterized by changing the gradation property of the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information from the above-mentioned smoothing means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention is used for the equipment reproducing natural images, such as television, and a video camera, a video printer, about an image processing system equipped with the function to detect the skin field of a portrait image, and relates to a suitable image processing system.
[0002]
[Description of the Prior Art] Generally, in an image processing system, in order to analyze and recognize the contents of the image, an object is extracted. There are an approach of asking for the border line of an object by detecting an edge as the technique, a method of extracting the field which divides an image into the subregion where brightness is uniform, and an object occupies, etc.
[0003] Moreover, with the equipment reproducing natural images, such as television, and a video camera, a video printer, processing of profile emphasis, gray scale conversion, etc. is performed to the object extracted with the above-mentioned image processing system. Thereby, the sharpness and the feeling of contrast of an image are raised.
[0004] Here, when processing a portrait image with the above image processing systems, in the skin field detection processing section of the above-mentioned image processing system, the field (henceforth a skin field) of a person's skin is detected. In order to detect the above-mentioned skin field, in the above-mentioned skin field detection processing section, the approach the color information for every pixel extracts a skin field, or the method of extracting a skin field by carrying out field division of the beige pixel extracted from color information paying attention to the connectivity of the location on an image, and analyzing the description of each field is used, for example.
[0005]
[Problem(s) to be Solved by the Invention] However, by the approach the color information for every pixel extracts a skin field, since it will be considered that all the beige fields in an image are skin fields, many incorrect detection had arisen. Or by the approach field division extracts a skin field, since much computation time was required, it was unsuitable for field division processing and feature-analysis processing of each field to the real-time operation.
[0006] Moreover, although profile emphasis processing or gradation transform processing was performed to the extracted object in order to raise the sharpness and the feeling of contrast of an image, profile emphasis processing or gradation transform processing was performed also to the skin field, especially the field (henceforth a face field) of a person's face. For this reason, for example, it will be emphasized to a face field and there was a problem of bringing about the result which is not desirable.
[0007] Then, this invention is made in view of the conventional actual condition like ****, and has the following purposes.
[0008] That is, the purpose of this invention is to offer the image processing system which can detect the analysis of a person's beige field, and a person's face field at high speed and correctly.
[0009] Moreover, the purpose of this invention is by carrying out profile emphasis of other fields to offer the image processing system which can raise the sharpness of an image, without carrying out profile emphasis of a person's face field.
[0010] Moreover, the purpose of this invention is by carrying out gray scale conversion of other fields to offer the image processing system which can raise the feeling of contrast of an image, without carrying out gray scale conversion of a person's face field.
[0011]
[Means for Solving the Problem] In order to solve an above-mentioned technical problem, the image

processing system concerning this invention It changes into the brightness data and color difference data which digitized the inputted portrait image data. It is the image processing system equipped with a skin field detection means to detect a skin field, from the digitized brightness data and color difference data. The above-mentioned skin field detection means A conversion means to change the above-mentioned brightness data and color difference data into 3 attribute data of brightness data, hue data, and chroma data, A beige pixel extract means to extract a beige pixel from 3 attribute data obtained by the above-mentioned conversion means, A beige pixel distribution generation means to generate spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means, It is characterized by having a face field judging means to judge the face field of a portrait image by making into a beige field the field where a beige pixel crowds from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means.

[0012] Moreover, the image processing system concerning this invention is characterized by the above-mentioned beige pixel distribution generation means generating the beige pixel distribution which is the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image.

[0013] Moreover, the image processing system concerning this invention is characterized by the above-mentioned beige pixel distribution generation means generating the beige pixel distribution which is the beige pixel histogram of the perpendicularly the number of the beige pixels horizontally located in a line for every vertical position of the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image, and a portrait image was accumulated.

[0014] Moreover, the image processing system concerning this invention is characterized by the above-mentioned face field judging means judging a face field by analyzing the ratio of beige area size and die length in every direction from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means.

[0015] Moreover, the image processing system concerning this invention is equipped with a perpendicular brightness change detection means to detect brightness change of the perpendicular direction in a beige field from the brightness data obtained by the above-mentioned conversion means. Brightness change distribution of brightness change of the perpendicular direction in the beige field detected by the above-mentioned perpendicular brightness change detection means while the above-mentioned beige pixel distribution generation means generated spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means is generated. The above-mentioned face field judging means It is characterized by judging the face field of a portrait image from the beige pixel distribution and brightness change distribution which were generated by the above-mentioned beige pixel distribution generation means.

[0016] Moreover, the image processing system concerning this invention is equipped with a calculation means within a block to compute the average value for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned beige pixel extract means extracts a beige block from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means Spatial beige block distribution of the beige block extracted by the above-mentioned beige pixel extract means is generated, and it is characterized by the above-mentioned face field judging means judging the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means.

[0017] Moreover, the image processing system concerning this invention It has a calculation means within a block to compute the average value for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means, and the maximum of brightness change of a block which divided into the block brightness change detected by the above-mentioned perpendicular brightness change detection means. The above-mentioned beige pixel extract means A beige block is extracted from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means Spatial beige block distribution of the beige block extracted by the above-mentioned beige block extract means and brightness change distribution of the maximum of brightness change of the block computed by the above-mentioned calculation means within a block are generated. The above-mentioned face field judging means is characterized by judging the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means, and brightness change distribution.

[0018] Moreover, it has a profile emphasis means perform profile emphasis processing to the brightness data of the inputted portrait image data, and a delay means give the amount of delay corresponding to the time amount which the above-mentioned profile emphasis processing takes the color-difference data of the inputted portrait image data, and the image processing system concerning this invention carries out controlling the above-mentioned profile emphasis means based on the skin field information detected by the above-mentioned skin field detection means as the description.
[0019] Moreover, a storage means to give and memorize the amount of delay corresponding to the time amount taken for the image processing system concerning this invention to detect skin field information for the portrait image data changed into brightness data and color difference data with the above-mentioned skin field detection means, A conversion means to change into 3 attribute data of brightness data, hue data, and chroma data the portrait image data memorized by the above-mentioned storage means, It has a detection means to detect beige data from 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned delay means The amount of delay corresponding to the time amount which the above-mentioned profile emphasis processing takes is given to the color difference data memorized by the above-mentioned storage means. The above-mentioned profile emphasis means It is characterized by performing profile emphasis processing to the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information detected by the above-mentioned skin field detection means.
[0020] Moreover, a scene change detection means to detect the change of a scene from the portrait image data into which the image processing system concerning this invention was inputted, It has a smoothing means to graduate in time the spatial location of the skin field information detected by the above-mentioned skin field detection means only when the same scene continued based on the detection result of the above-mentioned scene change detection means. The above-mentioned profile emphasis means is characterized by performing profile emphasis processing to the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information from the above-mentioned smoothing means.
[0021] Moreover, the image processing system concerning this invention is equipped with a delay means give the amount of delay corresponding to the time amount which takes the color-difference data of the portrait image data inputted as a gray-scale-conversion means change the gradation property of the brightness data of the inputted portrait image data to change a gradation property with the above-mentioned gray-scale-conversion means, and is characterized by to control the above-mentioned gray-scale-conversion means based on the skin field information detected by the above-mentioned skin field detection means.
[0022] Moreover, a storage means to give and memorize the amount of delay corresponding to the time amount taken for the image processing system concerning this invention to detect skin field information for the portrait image data changed into brightness data and color difference data with the above-mentioned skin field detection means, A conversion means to change into 3 attribute data of brightness data, hue data, and chroma data the portrait image data memorized by the above-mentioned storage means, It has a detection means to detect beige data from 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned delay means The amount of delay corresponding to the time amount taken to change a gradation property into the color difference data memorized by the above-mentioned storage means with the above-mentioned gray-scale-conversion means is given. The above-mentioned gray-scale-conversion means It is characterized by changing the gradation property of the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information detected by the above-mentioned skin field detection means.
[0023] Moreover, a scene change detection means to detect the change of a scene from the portrait image data into which the image processing system concerning this invention was inputted, It has a smoothing means to graduate in time the spatial location of the skin field information detected by the above-mentioned skin field detection means only when the same scene continued based on the detection result of the above-mentioned scene change detection means. The above-mentioned gray-scale-conversion means is characterized by changing the gradation property of the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information from the above-mentioned smoothing means.
[0024]
[Function] In the image processing system concerning this invention, a conversion means changes into 3 attribute data of brightness data, hue data, and chroma data the brightness data of portrait image data and

color difference data which were digitized. A beige pixel extract means extracts a beige pixel from 3 attribute data obtained by the above-mentioned conversion means. A beige pixel distribution generation means generates spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means. A face field judging means judges the face field of a portrait image by making into a beige field the field where a beige pixel crowds from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means.

[0025] Moreover, in the image processing system concerning this invention, the above-mentioned beige pixel distribution generation means generates the beige pixel distribution which is the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image.

[0026] Moreover, in the image processing system concerning this invention, the above-mentioned beige pixel distribution generation means generates the beige pixel distribution which is the beige pixel histogram of the perpendicularly the number of the beige pixels horizontally located in a line for every vertical position of the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image, and a portrait image was accumulated.

[0027] Moreover, in the image processing system concerning this invention, the above-mentioned face field judging means judges a face field by analyzing the ratio of beige area size and die length in every direction from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means.

[0028] Moreover, in the image processing system concerning this invention, a perpendicular brightness change detection means detects brightness change of the perpendicular direction in a beige field from the brightness data obtained by the above-mentioned conversion means. The above-mentioned beige pixel distribution generation means generates brightness change distribution of brightness change of the perpendicular direction in the beige field detected by the above-mentioned perpendicular brightness change detection means while generating spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means. The above-mentioned face field judging means judges the face field of a portrait image from the beige pixel distribution and brightness change distribution which were generated by the above-mentioned beige pixel distribution generation means.

[0029] Moreover, in the image processing system concerning this invention, the calculation means within a block computes the average for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned beige pixel extract means extracts a beige block from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means generates spatial beige block distribution of the beige block extracted by the above-mentioned beige pixel extract means. The above-mentioned face field judging means judges the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means.

[0030] Moreover, in the image processing system concerning this invention, the calculation means within a block computes the average value for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means, and the maximum of brightness change of a block which divided into the block brightness change detected by the above-mentioned perpendicular brightness change detection means. The above-mentioned beige pixel extract means extracts a beige block from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means generates spatial beige block distribution of the beige block extracted by the above-mentioned beige block extract means, and the brightness change distribution of the maximum of brightness change of the block computed by the above-mentioned calculation means within a block. The above-mentioned face field judging means judges the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means, and brightness change distribution.

[0031] Moreover, in the image processing system concerning this invention, a profile emphasis means performs profile emphasis processing to the brightness data of the portrait image data inputted by control based on the skin field information detected by the above-mentioned skin field detection means. A delay means gives the amount of delay corresponding to the time amount which the above-mentioned profile emphasis processing takes the color difference data of the inputted portrait image data.

[0032] Moreover, in the image processing system concerning this invention, a storage means gives and memorizes the amount of delay corresponding to the time amount taken to detect skin field information for the portrait image data changed into brightness data and color difference data with the above-mentioned skin

field detection means. A conversion means changes into 3 attribute data of brightness data, hue data, and chroma data the portrait image data memorized by the above-mentioned storage means. A detection means detects beige data from 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned delay means gives the amount of delay corresponding to the time amount which the above-mentioned profile emphasis processing takes to the color difference data memorized by the above-mentioned storage means. The above-mentioned profile emphasis means performs profile emphasis processing to the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information detected by the above-mentioned skin field detection means.

[0033] Moreover, in the image processing system concerning this invention, a scene change detection means detects the change of a scene from the inputted portrait image data. A smoothing means graduates in time the spatial location of the skin field information detected by the above-mentioned skin field detection means, only when the same scene continues based on the detection result of the above-mentioned scene change detection means. The above-mentioned profile emphasis means performs profile emphasis processing to the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information from the above-mentioned smoothing means.

[0034] Moreover, in the image processing system concerning this invention, a gray-scale-conversion means changes the gradation property of the brightness data of the portrait image data inputted by control based on the skin field information detected by the above-mentioned skin field detection means. A delay means gives the amount of delay corresponding to the time amount which takes the color difference data of the inputted portrait image data to change a gradation property with the above-mentioned gray-scale-conversion means.

[0035] Moreover, in the image processing system concerning this invention, a storage means gives and memorizes the amount of delay corresponding to the time amount taken to detect skin field information for the portrait image data changed into brightness data and color difference data with the above-mentioned skin field detection means. A conversion means changes into 3 attribute data of brightness data, hue data, and chroma data the portrait image data memorized by the above-mentioned storage means. A detection means detects beige data from 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned delay means gives the amount of delay corresponding to the time amount taken to change a gradation property into the color difference data memorized by the above-mentioned storage means with the above-mentioned gray-scale-conversion means. The above-mentioned gray-scale-conversion means changes the gradation property of the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information detected by the above-mentioned skin field detection means.

[0036] Moreover, in the image processing system concerning this invention, a scene change detection means detects the change of a scene from the inputted portrait image data. A smoothing means graduates in time the spatial location of the skin field information detected by the above-mentioned skin field detection means, only when the same scene continues based on the detection result of the above-mentioned scene change detection means. The above-mentioned gray-scale-conversion means changes the gradation property of the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information from the above-mentioned smoothing means.

[0037]

[Example] Hereafter, it explains, referring to a drawing about one example of this invention.

[0038] First, the image processing system concerning the 1st example of this invention is explained.

[0039] The above-mentioned image processing system is equipped with a skin field detection means 1 to detect the field (henceforth a skin field) of a person's skin, from the inputted image data. For example, the above-mentioned skin field detection means 1 The coordinate transformation machine 11 which changes the inputted image data into 3 attribute data of a color as shown in drawing 1 , The field of the beige pixel distribution generated on the histogram generation machine 12 which generates spatial beige pixel distribution a beige pixel's on memory 13 from 3 attribute data obtained with the above-mentioned coordinate transformation vessel 11, the above-mentioned memory 13, and the above-mentioned memory 13 to a person's face (it is hereafter called a face field.) It has the face field judging machine 14 to judge.

[0040] First, as shown in drawing 2 , digital conversion of the luminance signal Ya and color-difference signals Ua and Va of an analog which scanned Image P horizontally and were acquired is carried out by the analog-to-digital converter (henceforth an A/D converter) 101, and the luminance signal Yd and color-

difference signals Ud and Vd by which digital conversion was carried out are inputted into the face field detection means 1.

[0041] Hereafter, the above-mentioned face field detection means 1 is explained concretely.

[0042] The coordinate transformation machine 11 changes the luminance signal Yd by which digital conversion was carried out with above-mentioned A/D converter 101, and color-difference signals Ud and Vd into the brightness data Y which are 3 attribute data of a color, the hue data H, and the chroma data C. Although various things exist in the definition of 3 attribute data of a color, it asks for the brightness data Y, the hue data H, and the chroma data C by the operation shown in several 1 from a luminance signal Yd and color-difference signals Ud and Vd, for example.

[0043]

[Equation 1]

$$Y = Y_d$$

$$H = \tan^{-1}(V_d / U_d)$$

$$C = \sqrt{(U^2_d + V^2_d)}$$

[0044] The histogram generation machine 12 generates the horizontal beige pixel histogram SH which accumulated the number of the beige pixels perpendicularly located in a line with each horizontal position i of every [of Image P] on memory 13, as shown in drawing 3 .

[0045] That is, it judges whether to the brightness data Y obtained with the above-mentioned coordinate transformation vessel 11, the hue data H, and the chroma data C, in order to define the beige range, it has the brightness constants Ymin and Ymax and the hue constants Hmin and Hmax which were set up beforehand, and the chroma constants Cmin and Cmax, and the beige conditions which become Ymin<Y<YmaxHmin<H<HmaxCmin<C<Cmax are satisfied. For example, if Pixel S (i, j) shows the location on the image P corresponding to the above-mentioned brightness data Y, the hue data H, and the chroma data C the above-mentioned pixel S (i, j) -- the above -- when beige conditions are fulfilled and it is judged with it being beige, 1 is added to the i-th value SH of the beige pixel histogram SH on memory 13 [i] (SH[i] =SH[i]+1). By performing such processing for every horizontal position, the number of the beige pixels perpendicularly located in a line is accumulated, and the beige pixel histogram SH [i] is generated on memory 13.

[0046] When the beige pixel histogram SH of the image P of one sheet [i] is generated by the above-mentioned histogram generation machine 12 on memory 13, the face field judging machine 14 analyzes the beige pixel histogram SH [i], and detects the face field F of the person M of the image P shown in above-mentioned drawing 3 .

[0047] That is, as shown in drawing 4 , first, the beige pixel histogram SH [i] detects the horizontal position i where frequency is the largest, and let this be Maximum imax.

[0048] Next, the minimum points im and ip of appearing first toward order both directions focusing on the above-mentioned maximum imax are detected.

[0049] Next, the first points ialpham and ialphap corresponding to the frequency of alpha% of the above-mentioned maximum imax position frequency SH [imax] are detected toward order both directions focusing on the above-mentioned maximum imax. Here, the above "alpha" is a constant which fills 0<=alpha<=1.0 for defining the width of face of a skin field. However, when the point ialpham describing above does not exist in the range of im<=ialpham<=imax, or when the point ialphap describing above does not exist in the range of imax<=ialphap<=ip, it considers as ialpham=im and ialphap=ip respectively.

[0050] Thus, it judges whether the detected minimum points im and ip and Points ialpham and ialphap have threshold Tnum of the threshold Tasp1 of the minimum of the ratio of die length in every direction, the maximum threshold Tasp2, and the minimum of the number of pixels, and the conditional expression of the face field shown in several 2 is filled.

[0051]

[Equation 2]

$$T_{asp1} < ((i\alpha_p - i\alpha_m) / SH[i_{max}]) < T_{asp2}$$

$$\sum_{k=im}^{ip} SH[k] > T_{num}$$

[0052] When the conditional expression shown in two above is filled, it considers that the field Smp inserted into the minimum points im and ip is the face field F, and the minimum points im and ip are outputted as information on a face field. Or when the conditional expression shown in two above is not filled, the analysis processing mentioned above is repeated as SH[k] =0 (im<k<ip).
[0053] In addition, a constant alpha, each thresholds Tasp1 and Tasp2, and Tnum shall be set up beforehand.

[0054] Actuation of the skin field detection means 1 which carried out the above configurations is explained.
[0055] The luminance signal Yd and color-difference signals Ud and Vd of Image P by which digital conversion was carried out with A/D converter 101 are inputted into the coordinate transformation machine 11.
[0056] The above-mentioned coordinate transformation machine 11 changes into the brightness data Y, the hue data H, and the chroma data C the luminance signal Yd and color-difference signals Ud and Vd which were inputted, and supplies the changed brightness data Y, the hue data H, and the chroma data C to the histogram generation machine 12. The above-mentioned histogram generation machine 12 generates the beige pixel histogram SH [i] on memory 13 by judging whether the conditions that the brightness data Y from the above-mentioned coordinate transformation machine 11, the hue data H, and the chroma data C are beige are satisfied.
[0057] From the beige pixel histogram SH for one image generated on memory 13 with the above-mentioned histogram generation vessel 12 [i], the face field judging machine 14 detects the field where a beige pixel crowds as a skin field, and judges whether it is a face field based on the ratio of the detected skin area size and die length in every direction. And when the result of a judgment is a face field, the information im and ip on a face field is outputted.
[0058] As mentioned above, in this example, the horizontal beige pixel histogram SH [i] is generated. Since the field where a beige pixel crowds based on the above-mentioned beige pixel histogram SH [i] is detected as a skin field and the face field is judged based on the ratio of the detected skin area size and die length in every direction, The analysis of a person's skin field and a person's face field are correctly [at high speed and] detectable.
[0059] Next, the image processing system concerning the 2nd example of this invention is explained.
[0060] Although the above-mentioned image processing system is equipped with the skin field detection means 1 of the same configuration as the skin field detection means 1 of the image processing system concerning the 1st example mentioned above, the histogram generation machine 12 of the skin field detection means 1 in this example generates the horizontal beige pixel histogram SH [i] and the vertical beige pixel histogram SV [j] on memory 13, as shown in drawing 5 .
[0061] namely, when it judges that the location S on Image P (i, j) is beige the i-th value SH of the horizontal beige pixel histogram SH on memory 13 [i] -- 1 -- adding (SH[i] =SH[i]+1) -- 1 is added to the j-th value SV of the vertical beige pixel histogram SV [j] (SV[j] =SV [j] +1).
[0062] The beige pixel histogram SH horizontal on memory 13 [i] and the vertical beige pixel histogram SV [j] are generated. Thus, the face field judging machine 14 Based on the beige pixel histogram SH of the above-mentioned horizontal direction [i], and the vertical beige pixel histogram SV [j], it analyzes like the 1st example mentioned above, and the information im and ip on the face field in each direction, and jm and jp are outputted.
[0063] As mentioned above, in this example, since the vertical beige pixel histogram SV [j] is generated besides the horizontal beige pixel histogram SH [i], the analysis of a person's skin field and a person's face field can be detected more correctly.
[0064] Next, the image processing system concerning the 3rd example of this invention is explained.
[0065] In addition to the configuration of the skin field detection means 1 of the 1st and 2nd examples mentioned above, the above-mentioned image processing system is equipped with a skin field detection means 2 to have the perpendicular brightness change detector 21 which detects brightness change of the perpendicular direction in a skin field as shown in drawing 6 .
[0066] In addition, the same sign is given to the part which shows the same actuation as the image processing system shown in above-mentioned drawing 1 , and the detailed explanation is omitted.
[0067] That is, the above-mentioned perpendicular brightness change detector 21 generates the horizontal differential histogram DH [i] which accumulated the differential value of the perpendicular direction of the above-mentioned brightness data Y for every horizontal location among the brightness data Y changed by

the coordinate transformation machine 11, the hue data H, and the chroma data C on memory 13. Moreover, the differential histogram DV of the perpendicularly the differential value of the perpendicular direction of the above-mentioned brightness data Y was accumulated for every vertical location [j] is generated on memory 13.

[0068] for example, the differential value vij of the perpendicular direction of the brightness data Y in the location (i, j) of the arbitration on an image -- the constant dj of differential count -- having -- vij=|2Y(i, j)-Y (i, j-dj)-Y(i, j+dj) | -- it asks by the operation. This operation expression expresses the absolute value of a vertical secondary differential value.

[0069] Therefore, the differential value vij is added to the i-th value DH of the horizontal differential histogram DH on memory 13 [i] (DH[i] =DH[i]+vij). Moreover, the differential value vij is added to the j-th value DV of the vertical beige pixel histogram DV [j] (DV[j] =DV[j]+vij).

[0070] Thus, the differential histogram DH horizontal on memory 13 [i] and the vertical differential histogram DV [j] are generated.

[0071] On the other hand, the histogram generation machine 12 generates the horizontal beige pixel histogram SH [i] and the vertical beige pixel histogram SV [j] on memory 13, for example like the 2nd example mentioned above.

[0072] The face field judging machine 14 calculates the information im and ip on a face field, and jm and jp like the 2nd example of the above based on the horizontal beige pixel histogram SH [i] and the vertical beige pixel histogram SV [j]. Here, the above-mentioned face field judging machine 14 performs several 3 or the operation shown in several 4 based on the still more nearly horizontal differential histogram DH [i] and the vertical differential histogram DV [j].

[0073]

[Equation 3]

$$d = \sum_{k=im}^{ip} DH[k]$$

[0074]

[Equation 4]

$$d = \sum_{k=jm}^{jp} DV[k]$$

[0075] The information im and ip on the face field detected when it was more than threshold Tdev to which three above or the value d acquired by the operation shown by drawing 4 was set beforehand, and jm and jp are outputted, and when the above-mentioned value d is below threshold Tdev, analysis processing is repeated as SH[k] =0 (im<k<ip).

[0076] Actuation of the skin field detection means 2 which carried out the above configurations is explained.

[0077] The luminance signal Yd and color-difference signals Ud and Vd of Image P by which digital conversion was carried out with A/D converter 101 are inputted into the coordinate transformation machine 11.

[0078] The above-mentioned coordinate transformation machine 11 changes into the brightness data Y, the hue data H, and the chroma data C the luminance signal Yd and color-difference signals Ud and Vd which were inputted, and it supplies the brightness data Y to the perpendicular brightness change detector 21 while it supplies the changed brightness data Y, the hue data H, and the chroma data C to the histogram generation machine 12.

[0079] The above-mentioned histogram generation machine 12 generates the beige pixel histogram SH horizontal on memory 13 [i], and the vertical beige pixel histogram SV [j] by judging whether the conditions that the brightness data Y from the above-mentioned coordinate transformation machine 11, the hue data H, and the chroma data C are beige are satisfied.

[0080] On the other hand, the above-mentioned perpendicular brightness change detector 21 generates the horizontal differential histogram DH [i] which accumulated the differential value of the perpendicular direction of the brightness data Y from the above-mentioned coordinate transformation machine 11 for every horizontal location, and the differential histogram DV of the perpendicularly the differential value of the perpendicular direction of the above-mentioned brightness data Y was accumulated for every vertical location [j] on memory 13. From the beige pixel histogram SH [i] generated on memory 13 with the above-mentioned histogram generation vessel 12, and the beige pixel histogram SV [j], the face field judging machine 14 detects the field where a beige pixel crowds as a skin field, and judges whether it is a face field

based on the ratio of the detected skin area size and die length in every direction. And when the result of a judgment is a face field, based on the differential histogram DH [i] and the differential histogram DV [j] which were generated on memory 13 by the above-mentioned perpendicular brightness change detector 21, the information im, ip, jm, and jp on a face field is outputted.

[0081] Although the information im, ip, and jm on a face field based on distribution of brightness change of the above perpendicular directions and detection of jp are based on horizontal edges, such as an eye and opening, being contained in a person's face, they can avoid incorrect detection of a uniform field with little brightness change like a wall by judging a face field based on distribution of a vertical brightness change. Therefore, the analysis of a person's beige field and a person's face field can be detected more correctly.

[0082] In addition, in this example, although [the above-mentioned histogram generation machine 12] the horizontal beige pixel histogram SH [i] and the vertical beige pixel histogram SV [j] are generated on memory 13, it is good as generating the horizontal beige pixel histogram SH [i] on memory 13 as well as the 1st example mentioned above.

[0083] Next, the image processing system concerning the 4th example of this invention is explained.

[0084] In addition to the configuration of the skin field detection means 2 of the 3rd example mentioned above, the above-mentioned image processing system is equipped with a skin field detection means 3 to have the brightness data Y, the hue data H, the chroma data C, and the characteristic quantity calculation machine 31 within a block that equalizes the vertical brightness change vij per block as shown in drawing 7 .

[0085] In addition, the same sign is given to the part which shows the same actuation as above-mentioned drawing 1 and the image processing system shown in above-mentioned drawing 6 , and the detailed explanation is omitted.

[0086] That is, as shown in drawing 8 , the above-mentioned characteristic quantity calculation machine 31 within a block has the constants mi and mj showing the magnitude of Block B, and divides the brightness data Y of the image P changed by the coordinate transformation machine 11, the hue data H, and the chroma data C into the block B of the magnitude shown with the horizontal number of pixels (2mi+1), and the vertical number of pixels (2mj+1). Therefore, the number M of pixels within each block is M= (2mi+1) (2mj+1).
It can come out and express.

[0087] And it has the number M of pixels and the average value Yave of the brightness data Y for every block, the average value Have of the hue data H, and the average value Cave of chroma data are calculated by the operation shown in several 5, several 6, and several 7.

[0088]
[Equation 5]

$$Y_{ave} = \left(\sum_{dj=-mj}^{mj} \sum_{di=-mi}^{mi} Y(i+di, j+dj) \right) / M$$

[0089]
[Equation 6]

$$H_{ave} = \left(\sum_{dj=-mj}^{mj} \sum_{di=-mi}^{mi} H(i+di, j+dj) \right) / M$$

[0090]
[Equation 7]

$$C_{ave} = \left(\sum_{dj=-mj}^{mj} \sum_{di=-mi}^{mi} C(i+di, j+dj) \right) / M$$

[0091] Therefore, the histogram generation machine 12 is supplied as the values Yave, Have, and Cave computed as mentioned above and central value of each block of vibjbmax. the i-th block SH of the horizontal beige block histogram SH which is on memory 13 as the above-mentioned SUTOGURAMU generation machine 12 is shown in above-mentioned drawing 8 [ib] -- 1 -- adding (SH[ib] =SH[ib]+1) -- 1 is added to the j-th block SV of the vertical beige block histogram SV [jb] (SV[jb] =SV [jb] +1). Thus, on memory 13, the horizontal beige block histogram SV of a block unit [ib] and the vertical beige block histogram SV [jb] are generated.

[0092] Moreover, from the differential value vij of the perpendicularly it was obtained by the perpendicular brightness change detector 21, it asks for the above-mentioned characteristic quantity calculation machine 31 within a block by the operation which shows the maximum vibjbmax within a block to several 8.

[0093]
[Equation 8]

$$v_{ibjbmax} = \max_{\substack{-mj<dj<mj \\ -mi<di<mi}} (v_{i+di,\,j+dj})$$

[0094] Therefore, the above-mentioned maximum vibjbmax will be outputted to memory 13 as central value of each block. The differential value vibjb is added to the i-th block DH of the horizontal differential histogram DH on memory 13 [ib] (DH[ib] =DH[ib]+vibjb). Moreover, the differential value vibjb is added to the j-th block DV of the vertical beige pixel histogram DV [jb] (DV[jb] =DV[jb]+vibjb). Thus, on memory 13, the horizontal differential histogram DH of a block unit [ib] and the vertical differential histogram DV [jb] are generated.
[0095] The face field judging machine 14 judges whether it is a face field based on the magnitude of the beige block which detected and detected the beige block, and the ratio of die length in every direction like the 2nd example which mentioned above the beige block histogram SV[ib] beige block histogram SV [jb], the differential histogram DH [ib], and the differential histogram DV [jb] of the block unit generated on memory 13. and The center positions im, ip, jm, and jp of the block numbers ibm, ibp, jbm, and jbp of the beige block judged to be a face field im=ibm(2mi+1)+miip=ibp(2mi+1)+mijm=jbm(2mj+1)+mjjp=jbp By the operation which becomes (2mj+1)+mj, it asks, and the center positions im, ip, jm, and jp for which it asked are made into the coordinate which shows the boundary of a face field, and are outputted as information on a face field.
[0096] Actuation of the skin field detection means 3 which carried out the above configurations is explained.
[0097] The luminance signal Yd and color-difference signals Ud and Vd of Image P by which digital conversion was carried out with A/D converter 101 are inputted into the coordinate transformation machine 11.
[0098] The above-mentioned coordinate transformation machine 11 changes into the brightness data Y, the hue data H, and the chroma data C the luminance signal Yd and color-difference signals Ud and Vd which were inputted, and it supplies the brightness data Y to the perpendicular brightness change detector 21 while it supplies the changed brightness data Y, the hue data H, and the chroma data C to the characteristic quantity calculation machine 31 within a block.
[0099] The above-mentioned perpendicular brightness change detector 21 calculates the differential value vij of the perpendicular direction of the brightness data Y from the above-mentioned coordinate transformation machine 11, and supplies the calculated differential value vij to the above-mentioned characteristic quantity calculation machine 31 within a block.
[0100] The above-mentioned characteristic quantity calculation machine 31 within a block divides the brightness data Y from the above-mentioned coordinate transformation machine 11, the hue data H, and the chroma data C into a block, and supplies the average value Have of the hue data H which calculated and calculated the average value Yave of the brightness data Y for every block, the average value Have of the hue data H, and the average value Cave of chroma data, and the average value Cave of chroma data to the histogram generation machine 12.
[0101] The above-mentioned histogram generation machine 12 generates the beige block histogram SH horizontal on memory 13 [i], and the vertical beige block histogram SV [j] by judging whether the conditions that the averages Yave, Have, and Cave of the brightness data Y from the above-mentioned coordinate transformation machine 11, the hue data H, and the chroma data C are beige are satisfied.
[0102] Moreover, the above-mentioned characteristic quantity calculation machine 31 within a block outputs the maximum vibjbmax within the block which calculated and calculated the maximum vibjbmax within a block to memory 13 to the differential value vij from the above-mentioned perpendicular brightness change detector 21. Thereby, on memory 13, the horizontal differential histogram DH of a block unit [ib] and the vertical differential histogram DV [jb] are generated.
[0103] From the beige block histogram SH of the block unit generated on memory 13 [ib], and the beige block histogram SV [jb], the face field judging machine 14 detects the field where flesh color crowds as a skin field, and judges whether it is a face field based on the ratio of the detected skin area size and die length in every direction. And when the result of a judgment is a face field, based on the differential histogram DH of a block unit [ib] and the differential histogram DV [jb] which were generated on memory 13, the information im, ip, jm, and jp on a face field is outputted.
[0104] As mentioned above, in this example, an image is divided into a block, and since the face field is

detected based on the magnitude of the beige block which detected and detected the beige block based on distribution of the average color within a block, and the ratio of die length in every direction, the analysis of a person's beige field and a person's face field are correctly [at high speed and] detectable.
[0105] In addition, in this example, although [the above-mentioned histogram generation machine 12] the horizontal beige block histogram SH [ib] and the vertical beige block histogram SV [jb] are generated on memory 13, it is good also as generating the horizontal beige block histogram SH [ib] on memory 13.
[0106] Moreover, although [this example] the perpendicular brightness change detector 21 is formed, in the configuration of the skin field detection means 1 shown in above-mentioned drawing 1 , without forming the above-mentioned perpendicular brightness change detector 21, it is good also as equipping the latter part of the coordinate transformation machine 11 with the characteristic quantity calculation machine 31 within a block. In this case, a face field will be detected from the horizontal beige block histogram SH [ib], and the vertical beige block histogram SV [jb] or the vertical horizontal beige block histogram SH [ib].
[0107] Next, the image processing system concerning the 5th example of this invention is explained.
[0108] As the above-mentioned image processing system applies the skin field detection means 2 of the image processing system concerning the 3rd example mentioned above, for example, shows it to drawing 9 The skin field detection means 2 shown in above-mentioned drawing 6 , and the profile emphasis machine 4 which performs profile emphasis processing by control based on the information on the face field obtained by the above-mentioned skin field detection means 2, The delay machine 5 for taking the synchronization with the data and the input data which are outputted from the above-mentioned profile emphasis machine 4, A/D converter 101, and a digital to analog converter (it is hereafter called a D/A converter.) It has 102.
[0109] In addition, the same sign is given to the part which shows the same actuation as the skin field detection means 2 shown in above-mentioned drawing 6 , and the detailed explanation is omitted.
[0110] The luminance signal Yd and color-difference signals Ud and Vd by which digital conversion was carried out with A/D converter 101 are inputted into the above-mentioned skin field detection means 2, and the above-mentioned skin field detection means 2 detects a face field from the inputted luminance signal Yd and color-difference signals Ud and Vd, as mentioned above. And four coordinates which show the coordinate of the information im, ip, jm, and jp on the detected face field, i.e., the boundary of a face field, are supplied to the profile emphasis machine 4.
[0111] Here, in the above-mentioned skin field detection means 2, when judged with the pixel corresponding to the luminance signal Yd and color-difference signals Ud and Vd which were inputted being beige, the histogram generation machine 12 of the above-mentioned skin field detection means 2 supplies the beige detecting signal cntl1 which shows whether flesh color was detected to the profile emphasis machine 4.
[0112] Moreover, the luminance signal Yd by which digital conversion was carried out with A/D converter 101 is inputted into the above-mentioned profile emphasis machine 4. The above-mentioned profile emphasis machine 4 supplies the luminance signal Ydd which performed profile emphasis processing to the inputted luminance signal Yd, and performed profile emphasis processing to D/A converter 102.
[0113] When it exists in the field where the pixel corresponding to the luminance signal Yd into which the beige detecting signal cntl1 was supplied and inputted while the information im, ip, jm, and jp on a face field was supplied from the skin field detection means 2 is shown using the information im, ip, jm, and jp on the above-mentioned face field at this time, in case the above-mentioned profile emphasis machine 4 performs profile emphasis processing to the above-mentioned luminance signal Yd, it makes the degree of that emphasis small.
[0114] If it explains concretely, the information im, ip, jm, and jp on the face field supplied to the profile emphasis machine 4 from the skin field detection means 2 will be first acquired from the past image by one image in time than the image under current input. On the other hand, the beige detecting signal cntl1 supplied to the profile emphasis machine 4 from the skin field detection means 2 is the information about the color of each pixel of the image under current input. That is, the above-mentioned profile emphasis machine 4 adjusts extent of emphasis using the information on the face field obtained from the past image, and the color information on the pixel unit of the image under current input.
[0115] For example, as shown in drawing 10 , the above-mentioned profile emphasis machine 4 is equipped with the multiplier calculation machine 41, the multiplier smoothing machine 42, the emphasis signal generation machine 43, and the adder 45, and applies the conventional profile emphasis machine which adds secondary differential to the HARASHIN number.
[0116] Information im, ip, jm, and jp and the beige detecting signal cntl1 of a face field from the above-mentioned skin field detection means 2 are supplied to the above-mentioned multiplier calculation machine

41. The above-mentioned multiplier calculation machine 41 asks for the multiplier cij corresponding to the location on an image (i, j) from such information.
[0117] Namely, the function f0 (i, j) which makes "0" an output value when the location (i, j) on the image used as a current processing object is included to the face field (im<i<ip, jm<j<jp) and "1" is not included to a face field, When it is shown that a pixel current in the beige detecting signal cntl1 is beige (cntl 1= 1), "1", It has the function f1 (cntl1) which makes "0" an output value when it is shown that it is not beige (cntl 1= 0). They are the information im, ip, jm, and jp on a face field, and the multiplier cij corresponding to the location on [the beige detecting signal cntl1 to] an image (i, j) cij=1-f0(i, j) f1 (cntl1)
It asks by the becoming operation.
[0118] Therefore, the location (i, j) on the image used as a current processing object is included to a face field, and a multiplier cij is set to "0" only when the color is beige, and when other, it is set to "1."
[0119] Thus, the called-for multiplier cij is supplied to the multiplier smoothing machine 42. The above-mentioned multiplier smoothing machine 42 calculates the average [/ near the multiplier cij] cdij, in order to ease the discontinuity of a function f0 (i, j) and a function f1 (cntl1).
[0120] Namely, the several Ns pixel within a system of neighborhoods has the constants ni and nj showing the magnitude of the system of neighborhoods which calculates the average cdij, the horizontal number of pixels (2ni+1) which constitutes a system of neighborhoods, and the vertical number of pixels (2nj+1), and is N= (2ni+1) (2nj+1).
It can express.
[0121] Therefore, the above-mentioned multiplier smoothing machine 42 has a several Ns pixel within the above-mentioned system of neighborhoods, and calculates the average [/ near the multiplier cij] cdij by the operation which shows several 9.
[0122]
[Equation 9]

$$c^{d}_{ij} = \left(\sum_{dj=-nj}^{nj} \sum_{di=-ni}^{ni} c_{i+di,\, j+dj} \right) / N$$

[0123] And the above-mentioned multiplier smoothing machine 42 is supplied to the emphasis signal generation machine 43 by making into the smoothing correction factor cdij the average [/ near the multiplier cij for which it asked] cdij.
[0124] While the smoothing correction factor cdij is supplied from the above-mentioned multiplier smoothing machine 42, the luminance signal Yd by which digital conversion was carried out with A/D converter 101 is supplied to the above-mentioned emphasis signal generation machine 43.
[0125] The above-mentioned emphasis signal generation machine 43 generates the emphasis signal dY by [of the above-mentioned multiplier smoothing machine 42] taking advantaging smoothing correction factor cdij to the secondary differential value of the luminance signal Yd from above-mentioned A/D converter 101.
[0126] Namely, when a luminance signal Yd (i, j) shows the luminance signal Yd corresponding to the smoothing correction factor cdij, the above-mentioned emphasis signal dY has a constant di, and is dY=cdij (2Yd(i, j)-Yd(i+di, j)-Yd (i-di, j)).
It asks by the becoming operation. At this time, in order to take the synchronization of input data, suitable delay is given. And the above-mentioned emphasis signal generation machine 43 supplies the generated emphasis signal dY to an adder 45.
[0127] While the emphasis signal dY is supplied from the above-mentioned emphasis signal generation machine 43, the luminance signal Yd from above-mentioned A/D converter 101 is supplied to the above-mentioned adder 45.
[0128] The above-mentioned adder 45 adds the emphasis signal dY from the above-mentioned emphasis signal generation machine 43, and the luminance signal Yd (i, j) corresponding to the smoothing correction factor cdij from above-mentioned A/D converter 101, and outputs an addition result as a luminance signal Ydd which performed profile emphasis processing.
[0129] namely, the luminance signal Ydd (i, j) which performed profile emphasis processing to the luminance signal Yd (i, j) of the location (i, j) on the image used as a current processing object -- Ydd(i, j) =Yd(i, j)+dY -- it asks by the operation.
[0130] As mentioned above, the profile emphasis machine 4 controls extent of emphasis by Information im, ip, jm, and jp and the beige detecting signal cntl1 of a face field from the skin field detection means 2 for every pixel, and performs profile emphasis processing to the inputted luminance signal Yd. And the

luminance signal Ydd which performed profile emphasis processing is supplied to D/A converter 102. Here, in the profile emphasis processing mentioned above, in order to take the synchronization of input data, suitable delay is given.

[0131] On the other hand, the color-difference signals Ud and Vd by which digital conversion was carried out with A/D converter 101 are inputted into the delay machine 5. The above-mentioned delay machine 5 is delayed in the inputted color-difference signals Ud and Vd, and the synchronization with the luminance signal Ydd to which profile emphasis processing was performed with the above-mentioned profile emphasis vessel 4 is taken. The color-difference signals Ud and Vd delayed with the above-mentioned delay vessel 5 are supplied to D/A converter 102.

[0132] Therefore, above-mentioned D/A converter 102 carries out analogue conversion of the luminance signal Ydd to which profile emphasis processing was performed with the above-mentioned profile emphasis vessel 4, and the color-difference signals Ud and Vd with which the above-mentioned luminance signal Ydd and the synchronization were taken with the above-mentioned delay vessel 5, and outputs them as a luminance signal Yda and color-difference signals Ua and Va.

[0133] Actuation of the image processing system which carried out the above configurations is explained.

[0134] A/D converter 101 carries out digital conversion of the luminance signal Ya and color-difference signals Ua and Va which were inputted, supplies the above-mentioned luminance signal Yd to the profile emphasis machine 4, and supplies the above-mentioned color-difference signals Ud and Vd to the delay machine 5 while it supplies the luminance signal Yd and color-difference signals Ud and Vd which carried out digital conversion to the skin field detection means 2.

[0135] The above-mentioned skin field detection means 2 detects a skin field from the luminance signal Yd and color-difference signals Ud and Vd from above-mentioned A/D converter 101, and supplies the beige detecting signal cntl1 which shows a detection result to the profile emphasis machine 4. Moreover, by analyzing the detected skin field, a face field is detected and the information im, ip, jm, and jp on the detected face field is supplied to the profile emphasis machine 4.

[0136] The above-mentioned profile emphasis machine 4 supplies the luminance signal Yda which performed profile emphasis processing to the luminance signal Yd from above-mentioned A/D converter 101, and performed profile emphasis processing to D/A converter 102.

[0137] At this time, to the field shown using the information im, ip, jm, and jp on the face field from the above-mentioned skin field detection means 2 The pixel corresponding to the luminance signal Yd used as a current processing object is contained. When the beige thing is shown, the pixel from which the beige detecting signal cntl1 from the above-mentioned skin field detection means 2 serves as a current processing object and the above-mentioned profile emphasis machine 4 The luminance signal Yda which made the degree of emphasis small, performed profile emphasis processing to the above-mentioned luminance signal Yd, and performed profile emphasis processing is supplied to D/A converter 102.

[0138] The delay machine 5 takes the synchronization with the luminance signal Yda to which the color-difference signals Ua and Va from above-mentioned A/D converter 101 were delayed, and profile emphasis processing was performed with the above-mentioned profile emphasis vessel 4, and supplies the delayed color-difference signals Ua and Va to D/A converter 102.

[0139] Above-mentioned D/A converter 102 carries out analogue conversion of the luminance signal Ydd from the above-mentioned profile emphasis machine 4, and the color-difference signals Ud and Vd from the above-mentioned delay machine 5, and outputs them as a luminance signal Yad and color-difference signals Ua and Va.

[0140] As mentioned above, in this example, the skin field detection means 2 shown in above-mentioned drawing 6 is applied, and since the degree of emphasis is adjusted and profile emphasis processing is performed by the beige detecting signal of the pixel unit of the information on a face field over the image of the past obtained by the above-mentioned skin field detection means 2, and the image under present input, other fields can be emphasized, without emphasizing the field of a person's face. Therefore, the sharpness of an image can be raised.

[0141] Next, the image processing system concerning the 6th example of this invention is explained.

[0142] As the above-mentioned image processing system is shown in drawing 11 , in the configuration of the image processing system concerning the 5th example mentioned above In addition, the image memory 6 which memorizes the luminance signal Yd by which digital conversion was carried out with A/D converter 101, and color-difference signals Ud and Vd, It has the coordinate transformation machine 7 which changes into 3 attribute data of a color the luminance signal Yd memorized in the above-mentioned image memory 6, and color-difference signals Ud and Vd, and the beige pixel detector 8 which detects whether 3 attribute

data changed by the above-mentioned coordinate transformation machine 7 fulfills beige conditions.
[0143] Moreover, in the above-mentioned image processing system, the beige detecting signal cntl1 will not be outputted from the skin field detection means 2, but the beige detecting signal cntl1 will be outputted from the above-mentioned beige pixel detector 8 to the profile emphasis machine 4. Furthermore, the luminance signal Yd memorized in the image memory 6 will be supplied to the above-mentioned profile emphasis machine 4, and the color-difference signals Ud and Vd memorized by the delay machine 5 in the image memory 6 will be supplied to it.
[0144] In addition, the same sign is given to the part which shows the same actuation as the image processing system shown in above-mentioned drawing 9 , and the detailed explanation is omitted.
[0145] That is, in this example, the amount of delay of delay corresponding to the time amount taken to detect the information im, ip, jm, and jp on a face field with the skin field detection means 2, for example, the amount for 1 pixel, is given to the inputted luminance signal Yd and color-difference signals Ud and Vd using an image memory 6. While the luminance signal Yd and color-difference signals Ud and Vd which were delayed with the above-mentioned image memory 6 are supplied to the coordinate transformation machine 7, the above-mentioned luminance signal Yd is supplied to the profile emphasis machine 4, and the above-mentioned color-difference signals Ud and Vd are supplied to the delay machine 5.
[0146] The above-mentioned coordinate transformation machine 7 changes the luminance signal Yd and color-difference signals Ud and Vd from the above-mentioned image memory 6 into the brightness data Y, the hue data H, and the chroma data C, and supplies the changed brightness data Y, the hue data H, and the chroma data C to the beige pixel detector 8. It judges whether the above-mentioned beige pixel detector 8 fills condition Ymin<Y<YmaxHmin<H<HmaxCmin<C<Cmax which was used when detecting a skin field in the conditions 12, i.e., the histogram generation machine, that the brightness data Y, the hue data H, and the chroma data C are beige from the above-mentioned coordinate transformation machine 7 and which was mentioned above. Therefore, the judgment result will be supplied to the profile emphasis machine 4 as a beige detecting signal cntl1.
[0147] On the other hand, the information im, ip, jm, and jp on the face field detected by the skin field detection means 2 is supplied to the profile emphasis machine 4.
[0148] Actuation of the image processing system which carried out the above configurations is explained.
[0149] A/D converter 101 carries out digital conversion of the luminance signal Ya and color-difference signals Ua and Va which were inputted, and it supplies them to an image memory 6 while it supplies the luminance signal Yd and color-difference signals Ud and Vd which carried out digital conversion to the skin field detection means 2.
[0150] The above-mentioned image memory 6 supplies the luminance signal Yd and color-difference signals Ud and Vd which gave the amount of delay for 1 pixel to a luminance signal Yd and color-difference signals Ud and Vd from above-mentioned A/D converter 101, and gave the amount of delay to the coordinate transformation machine 7. Moreover, the above-mentioned image memory 6 supplies the above-mentioned luminance signal Yd to the profile emphasis machine 4, and supplies the above-mentioned color-difference signals Ud and Vd to the delay machine 5.
[0151] The above-mentioned coordinate transformation machine 7 changes the luminance signal Yd and color-difference signals Ud and Vd from the above-mentioned image memory 6 into the brightness data Y, the hue data H, and the chroma data C, and supplies the changed brightness data Y, the hue data H, and the chroma data C to the beige pixel detector 8. The brightness data Y from the above-mentioned coordinate transformation machine 7, the hue data H, and the chroma data C judge whether beige conditions are fulfilled, and supply the above-mentioned beige pixel detector 8 to the profile emphasis machine 4 by making a judgment result into the beige detecting signal cntl1.
[0152] On the other hand, from the luminance signal Yd and color-difference signals Ud and Vd from above-mentioned A/D converter 101, the skin field detection means 2 detects a skin field, by analyzing the detected skin field, detects a face field and supplies the information im, ip, jm, and jp on the detected face field to the profile emphasis machine 4. The above-mentioned profile emphasis machine 4 supplies the luminance signal Yda which performed profile emphasis processing to the luminance signal Yd from the above-mentioned image memory 6, and performed profile emphasis processing to D/A converter 102.
[0153] At this time, to the field shown using the information im, ip, jm, and jp on the face field from the above-mentioned skin field detection means 2 The pixel corresponding to the luminance signal Yd used as a current processing object is contained. When the beige thing is shown, the pixel from which the beige detecting signal cntl1 from the above-mentioned skin field detection means 2 serves as a current processing object and the above-mentioned profile emphasis machine 4 The luminance signal Yda which made the

degree of emphasis small, performed profile emphasis processing to the above-mentioned luminance signal Yd, and performed profile emphasis processing is supplied to D/A converter 102.
[0154] Moreover, the above-mentioned delay machine 5 takes the synchronization with the luminance signal Yda to which the color-difference signals Ua and Va from the above-mentioned image memory 6 were delayed, and profile emphasis processing was performed with the above-mentioned profile emphasis vessel 4, and supplies the delayed color-difference signals Ua and Va to D/A converter 102.
[0155] Above-mentioned D/A converter 102 carries out analogue conversion of the luminance signal Ydd from the above-mentioned profile emphasis machine 4, and the color-difference signals Ud and Vd from the above-mentioned delay machine 5, and outputs them as a luminance signal Yad and color-difference signals Ua and Va.
[0156] As mentioned above, the information im, ip, jm, and jp on the face field obtained with the above-mentioned skin field detection means 2 is searched for from the image which actually performs profile emphasis processing with the profile emphasis vessel 4. Therefore, since the location of a more exact face field can be made to reflect in profile emphasis processing, the sharpness of an image can be raised more.
[0157] Next, the image processing system concerning the 7th example of this invention is explained.
[0158] The above-mentioned image processing system is added to the configuration of the image processing system concerning the 7th example mentioned above, as shown in drawing 12 . The scene change detector 9 which detects the change of a scene from the luminance signal Yd by which digital conversion was carried out with A/D converter 101, and color-difference signals Ud and Vd, It has the face field smoothing machine 10 which performs time data smoothing to the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2 based on the detection result of the above-mentioned scene change detector 9.
[0159] Moreover, in the above-mentioned image processing system, the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2 is supplied to the profile emphasis machine 4 through the face field smoothing machine 10. Furthermore, the amount of delay in an image memory 6 is made into time amount twice the amount of delay of taking to detect the information on a face field with the skin field detection means 2, and the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2 and the image to which profile emphasis processing is performed with the profile emphasis vessel 4 are made to correspond completely in the above-mentioned image processing system.
[0160] In addition, the same sign is given to the part which shows the same actuation as the image processing system shown in above-mentioned drawing 11 , and the detailed explanation is omitted.
[0161] That is, the scene change detector 9 detects whether the scene change occurred between the image corresponding to the luminance signal Yd and color-difference signals Ud and Vd which were inputted, and the image corresponding to the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2.
[0162] When it explains concretely and the time amount taken to detect the information on a face field with the above-mentioned skin field detection means 2, for example is one image, the above-mentioned scene change detector 9 detects whether the scene change occurred between the image to which profile emphasis processing is performed with the profile emphasis vessel 4, and the image inputted into 1 image quota in time than it.
[0163] Detection of such a scene change can apply the detection approach used conventionally.
[0164] Therefore, the detection result of the above-mentioned scene change detector 9 is supplied to the face field smoothing machine 10 as a control signal cntl2.
[0165] The above-mentioned face field smoothing machine 10 graduates in time the spatial location of the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2, and supplies it to the profile emphasis machine 4 as information idm, idp, jdm, and jdp on a face field.
[0166] For example, it has the contribution p of the face field boundary coordinate ln (= im, ip, jm, jp) computed from the image of time of day n, the boundary coordinate ldn (= idm, idp, jdm, jdp) used for the profile emphasis processing to the image of time of day n, and the boundary coordinate acquired at current time as time data smoothing, and recursive filtering which becomes ldn=pln+(1-p) ldn-1 is used.
[0167] When the control signal cntl2 from the above-mentioned scene change detector 9 shows scene change generating at this time, the above-mentioned face field smoothing machine 10 does not perform the above time data smoothing, but supplies the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2 to the profile emphasis machine 4 as they are.
[0168] Actuation of the image processing system which carried out the above configurations is explained.
[0169] A/D converter 101 carries out digital conversion of the luminance signal Ya and color-difference

signals Ua and Va which were inputted, and supplies respectively the luminance signal Yd and color-difference signals Ud and Vd which carried out digital conversion to the skin field detection means 2, an image memory 6, and the scene change detector 9.

[0170] The above-mentioned image memory 6 supplies the luminance signal Yd and color-difference signals Ud and Vd which gave the amount of delay for 1 pixel to a luminance signal Yd and color-difference signals Ud and Vd from above-mentioned A/D converter 101, and gave the amount of delay to the coordinate transformation machine 7. Moreover, the above-mentioned image memory 6 supplies the above-mentioned luminance signal Yd to the profile emphasis machine 4, and supplies the above-mentioned color-difference signals Ud and Vd to the delay machine 5.

[0171] The above-mentioned coordinate transformation machine 7 changes the luminance signal Yd and color-difference signals Ud and Vd from the above-mentioned image memory 6 into the brightness data Y, the hue data H, and the chroma data C, and supplies the changed brightness data Y, the hue data H, and the chroma data C to the beige pixel detector 8.

[0172] The brightness data Y from the above-mentioned coordinate transformation machine 7, the hue data H, and the chroma data C judge whether beige conditions are fulfilled, and supply the above-mentioned beige pixel detector 8 to the profile emphasis machine 4 by making a judgment result into the beige detecting signal cntl1.

[0173] On the other hand, from the luminance signal Yd and color-difference signals Ud and Vd from above-mentioned A/D converter 101, the skin field detection means 2 detects a skin field, by analyzing the detected skin field, detects a face field and supplies the information im, ip, jm, and jp on the detected face field to the face field smoothing machine 10.

[0174] Moreover, the scene change detector 9 detects whether the scene change occurred between the image corresponding to the luminance signal Yd and color-difference signals Ud and Vd from above-mentioned A/D converter 101, and the image corresponding to the information im, ip, jm, and jp on the face field obtained by the above-mentioned skin field detection means 2, and supplies it to the face field smoothing machine 10 by making a detection result into a control signal cntl2.

[0175] The above-mentioned face field smoothing machine 10 supplies the information idm, idp, jdm, and jdp on a face field that graduated the spatial location of the information im, ip, jm, and jp on the face field from the above-mentioned skin field detection means 2 in time, and it was graduated to the profile emphasis machine 4 based on the control signal cntl2 from the above-mentioned scene change detector 9.

[0176] The above-mentioned profile emphasis machine 4 supplies the luminance signal Yda which performed profile emphasis processing to the luminance signal Yd from the above-mentioned image memory 6, and performed profile emphasis processing to D/A converter 102. At this time, to the field shown using the information idm, idp, jdm, and jdp on the face field from the above-mentioned face field smoothing machine 10 The pixel corresponding to the luminance signal Yd used as a current processing object is contained. When the beige thing is shown, the pixel from which the beige detecting signal cntl1 from the above-mentioned skin field detection means 2 serves as a current processing object and the above-mentioned profile emphasis machine 4 The luminance signal Yda which made the degree of emphasis small, performed profile emphasis processing to the above-mentioned luminance signal Yd, and performed profile emphasis processing is supplied to D/A converter 102.

[0177] Moreover, the above-mentioned delay machine 5 takes the synchronization with the luminance signal Yda to which the color-difference signals Ua and Va from the above-mentioned image memory 6 were delayed, and profile emphasis processing was performed with the above-mentioned profile emphasis vessel 4, and supplies the delayed color-difference signals Ua and Va to D/A converter 102.

[0178] Above-mentioned D/A converter 102 carries out analogue conversion of the luminance signal Ydd from the above-mentioned profile emphasis machine 4, and the color-difference signals Ud and Vd from the above-mentioned delay machine 5, and outputs them as a luminance signal Yad and color-difference signals Ua and Va.

[0179] As mentioned above, in this example, since time data smoothing is not performed to the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2 when it is the same scene, time fluctuation of the face field in the same scene can be eased. Therefore, although [the still more nearly above-mentioned example which can raise the sharpness of an image] the scene change detector 9 and the face field smoothing machine 10 are added to the configuration of the image processing system concerning the 7th example mentioned above, it is good also as adding the scene change detector 9 and the face field smoothing machine 10 to the configuration of the image processing system concerning the 5th example mentioned above.

[0180] Next, the image processing system concerning the 8th example of this invention is explained.
[0181] The above-mentioned image processing system transposes the profile emphasis machine 4 of the image processing system concerning the 5th example mentioned above to a gradation converter.
[0182] The above-mentioned gradation transducer is equipped with the multiplier calculation machine 41, the multiplier smoothing machine 42, the level converter 403, and the adder 404 with weight as shown in drawing 13 .
[0183] In addition, the same sign is given to the part which shows the same actuation as the profile emphasis machine shown in above-mentioned drawing 10 , and the detailed explanation is omitted.
[0184] The above-mentioned multiplier calculation machine 41 and the multiplier smoothing machine 42 are the same as what is prepared in the profile emphasis machine 4 mentioned above, and supply the smoothing correction factor cdij which computed and computed the smoothing correction factor cdij to a level converter 403 like the case of the above-mentioned profile emphasis machine 4.
[0185] The above-mentioned level converter 403 generates the luminance signal Yce which performed gradation transform processing to the inputted luminance signal Yd, and performed gradation transform processing.
[0186] The above-mentioned gray scale conversion has a transform function g, and is Yce=g (Yd).
It comes out, and as it is shown and a transform function g is shown in drawing 14 , it is a nonlinear increasing function. Moreover, it depends for the configuration on the property of the image which should be changed. Thus, the approach of constituting a transform function g from an image can apply the approach used conventionally.
[0187] The luminance signal Yce to which gradation transform processing was performed by the above-mentioned level converter 403 is supplied to the adder 404 with weight. While a luminance signal Yce is supplied from the above-mentioned level converter 403, the inputted luminance signal Yd is supplied to the above-mentioned adder 404 with weight. Moreover, the smoothing correction factor cdij obtained with the multiplier smoothing vessel 42 is supplied to the above-mentioned adder 404 with weight through the above-mentioned level converter 403.
[0188] The above-mentioned adder 404 with weight performs addition with weight of the inputted luminance signal Yd and the luminance signal Yce from the above-mentioned level converter 403. The smoothing correction factor cdij obtained with the multiplier smoothing vessel 42 is used for the weight used at this time.
[0189] That is, the luminance signal Ydd with which gradation transform processing was performed to the inputted luminance signal Yd is searched for by the operation which becomes Ydd=(1-cdij) Yd+cdijYce.
[0190] This shows that the weight of the luminance signal Yd which the current pixel was located in the face field, and was inputted when beige (i.e., when the smoothing correction factor cdij is small) becomes large, and the weight of the luminance signal Yce to which gradation transform processing was performed by the level converter 403 becomes large in being other.
[0191] As mentioned above, in this example, since weight adjustment is carried out with the smoothing correction factor cdij based on the beige detecting signal cntl1 of the pixel unit of the image under input and gradation modulation processing is performed, the feeling of contrast of an image can be raised by carrying out gray scale conversion of other fields, without carrying out gray scale conversion of a person's face field.
[0192] In addition, although the profile emphasis machine 4 of the image processing system concerning the 5th example mentioned above shall be placed and replaced with a gradation converter in the example mentioned above, it is good also as what places and replaces with a gradation converter the profile emphasis machine 4 of the image processing system concerning the 6th example mentioned above. In this case, since the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2 is computed from the image which actually performs gradation transform processing, it can make the location of a face field reflect in gradation transform processing more correctly. Therefore, the feeling of contrast of an image can be raised further.
[0193] Moreover, it is good also as what places and replaces with a gradation converter the profile emphasis machine 4 of the image processing system concerning the 7th example mentioned above. In this case, since time fluctuation of the face field in the same scene can be eased, the feeling of contrast of an image can be raised further.
[0194] In addition, although the skin field detection means of the image processing system concerning the 3rd example shall be applied in the 5th - the 8th example which were mentioned above, it is good also as what applies the skin field detection means of the image processing system concerning the 1st, 2nd, and 4th examples.

[0195]
[Effect of the Invention] In the image processing system concerning this invention, a conversion means changes into 3 attribute data of brightness data, hue data, and chroma data the brightness data of portrait image data and color difference data which were digitized. A beige pixel extract means extracts a beige pixel from 3 attribute data obtained by the above-mentioned conversion means. A beige pixel distribution generation means generates spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means. A face field judging means judges the face field of a portrait image by making into a beige field the field where a beige pixel crowds from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means. Thereby, the analysis of a person's beige field and a person's face field are correctly [at high speed and] detectable.
[0196] Moreover, in the image processing system concerning this invention, the above-mentioned beige pixel distribution generation means generates the beige pixel distribution which is the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image. Thereby, the analysis of a person's beige field and a person's face field can be detected more correctly.
[0197] Moreover, in the image processing system concerning this invention, the above-mentioned beige pixel distribution generation means generates the beige pixel distribution which is the beige pixel histogram of the perpendicularly the number of the beige pixels horizontally located in a line for every vertical position of the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image, and a portrait image was accumulated. Thereby, the analysis of a person's beige field and a person's face field can be detected more correctly.
[0198] Moreover, in the image processing system concerning this invention, the above-mentioned face field judging means judges a face field by analyzing the ratio of beige area size and die length in every direction from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means. Thereby, the analysis of a person's beige field and a person's face field can be detected more correctly.
[0199] Moreover, in the image processing system concerning this invention, a perpendicular brightness change detection means detects brightness change of the perpendicular direction in a beige field from the brightness data obtained by the above-mentioned conversion means. The above-mentioned beige pixel distribution generation means generates brightness change distribution of brightness change of the perpendicular direction in the beige field detected by the above-mentioned perpendicular brightness change detection means while generating spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means. The above-mentioned face field judging means judges the face field of a portrait image from the beige pixel distribution and brightness change distribution which were generated by the above-mentioned beige pixel distribution generation means. Thereby, the analysis of a person's beige field and a person's face field can be detected more correctly.
[0200] Moreover, in the image processing system concerning this invention, the calculation means within a block computes the average for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned beige pixel extract means extracts a beige block from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means generates spatial beige block distribution of the beige block extracted by the above-mentioned beige pixel extract means. The above-mentioned face field judging means judges the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means. Thereby, the analysis of a person's beige field and a person's face field can be detected more correctly.
[0201] Moreover, in the image processing system concerning this invention, the calculation means within a block computes the average value for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means, and the maximum of brightness change of a block which divided into the block brightness change detected by the above-mentioned perpendicular brightness change detection means. The above-mentioned beige pixel extract means extracts a beige block from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means generates spatial beige block distribution of the beige block extracted by the above-mentioned beige block extract means, and the brightness change distribution of the maximum of brightness change of the block computed by the above-mentioned calculation means within a block. The above-mentioned face field judging means judges the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means, and brightness

change distribution. Thereby, the analysis of a person's beige field and a person's face field can be detected more correctly.

[0202] Moreover, in the image processing system concerning this invention, a profile emphasis means performs profile emphasis processing to the brightness data of the portrait image data inputted by control based on the skin field information detected by the above-mentioned skin field detection means. A delay means gives the amount of delay corresponding to the time amount which the above-mentioned profile emphasis processing takes the color difference data of the inputted portrait image data. Thereby, the sharpness of an image can be raised by carrying out profile emphasis of other fields, without carrying out profile emphasis of a person's face field.

[0203] Moreover, in the image processing system concerning this invention, a storage means gives and memorizes the amount of delay corresponding to the time amount taken to detect skin field information for the portrait image data changed into brightness data and color difference data with the above-mentioned skin field detection means. A conversion means changes into 3 attribute data of brightness data, hue data, and chroma data the portrait image data memorized by the above-mentioned storage means. A detection means detects beige data from 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned delay means gives the amount of delay corresponding to the time amount which the above-mentioned profile emphasis processing takes to the color difference data memorized by the above-mentioned storage means. The above-mentioned profile emphasis means performs profile emphasis processing to the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information detected by the above-mentioned skin field detection means. Thereby, the sharpness of an image can be raised further. Moreover, in the image processing system concerning this invention, a scene change detection means detects the change of a scene from the inputted portrait image data. A smoothing means graduates in time the spatial location of the skin field information detected by the above-mentioned skin field detection means, only when the same scene continues based on the detection result of the above-mentioned scene change detection means. The above-mentioned profile emphasis means performs profile emphasis processing to the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information from the above-mentioned smoothing means. Thereby, since time fluctuation of the face field in the same scene can be eased, the sharpness of an image can be raised further.

[0204] Moreover, in the image processing system concerning this invention, a gray-scale-conversion means changes the gradation property of the brightness data of the portrait image data inputted by control based on the skin field information detected by the above-mentioned skin field detection means. A delay means gives the amount of delay corresponding to the time amount which takes the color difference data of the inputted portrait image data to change a gradation property with the above-mentioned gray-scale-conversion means. Thereby, the feeling of contrast of an image can be raised by carrying out gray scale conversion of other fields, without carrying out gray scale conversion of a person's face field.

[0205] Moreover, in the image processing system concerning this invention, a storage means gives and memorizes the amount of delay corresponding to the time amount taken to detect skin field information for the portrait image data changed into brightness data and color difference data with the above-mentioned skin field detection means. A conversion means changes into 3 attribute data of brightness data, hue data, and chroma data the portrait image data memorized by the above-mentioned storage means. A detection means detects beige data from 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned delay means gives the amount of delay corresponding to the time amount taken to change a gradation property into the color difference data memorized by the above-mentioned storage means with the above-mentioned gray-scale-conversion means. The above-mentioned gray-scale-conversion means changes the gradation property of the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected with the above-mentioned detection means by the control based on the skin field information detected by the above-mentioned skin field detection means. Thereby, the feeling of contrast of an image can be raised further.

[0206] Moreover, in the image processing system concerning this invention, a scene change detection means detects the change of a scene from the inputted portrait image data. A smoothing means graduates in time the spatial location of the skin field information detected by the above-mentioned skin field detection means, only when the same scene continues based on the detection result of the above-mentioned scene change detection means. The above-mentioned gray-scale-conversion means changes the gradation property of the brightness data of the portrait image data corresponding to the above-mentioned judgment result detected

with the above-mentioned detection means by the control based on the skin field information from the above-mentioned smoothing means. Thereby, since time fluctuation of the face field in the same scene can be eased, the feeling of contrast of an image can be raised further.

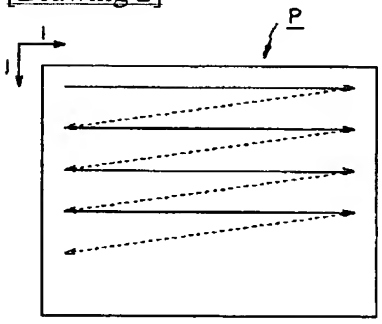
[Translation done.]

* NOTICES *

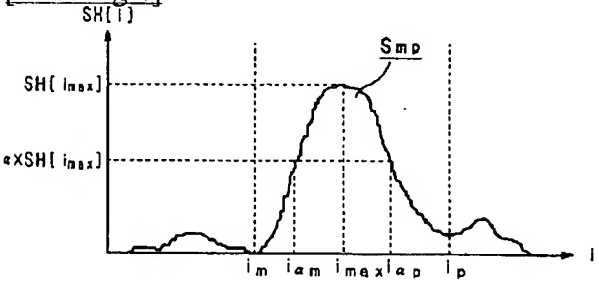
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

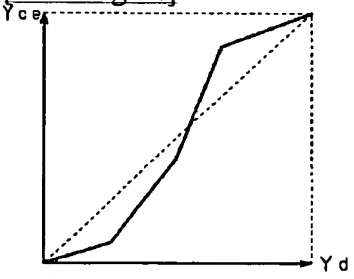
[Drawing 2]



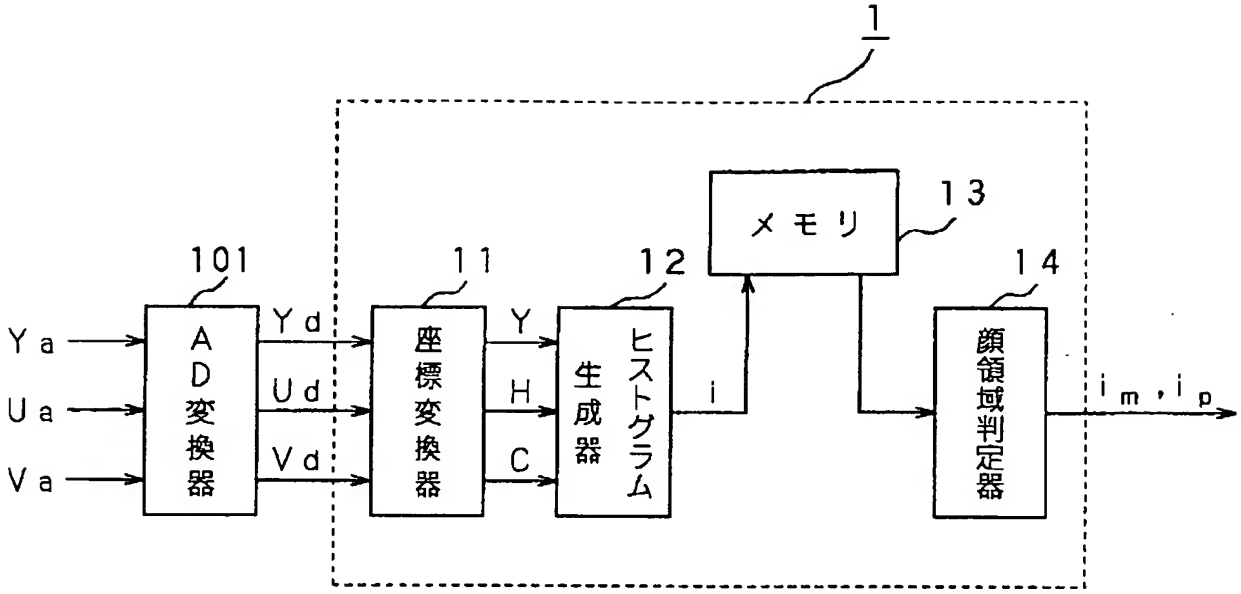
[Drawing 4]



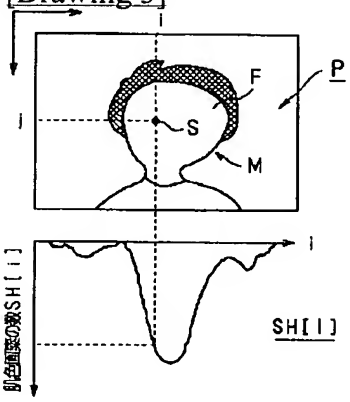
[Drawing 14]



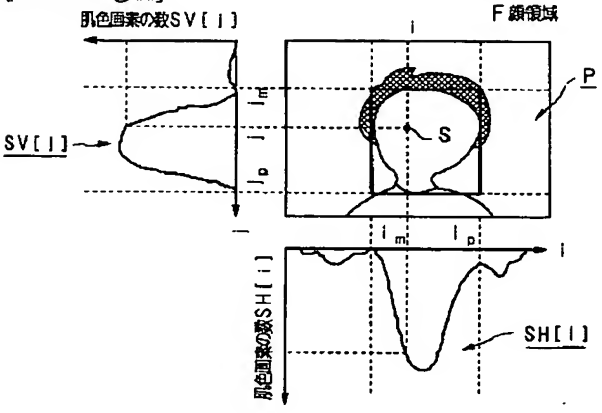
[Drawing 1]



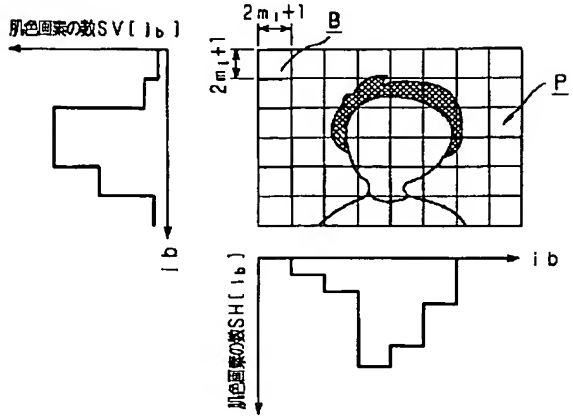
[Drawing 3]



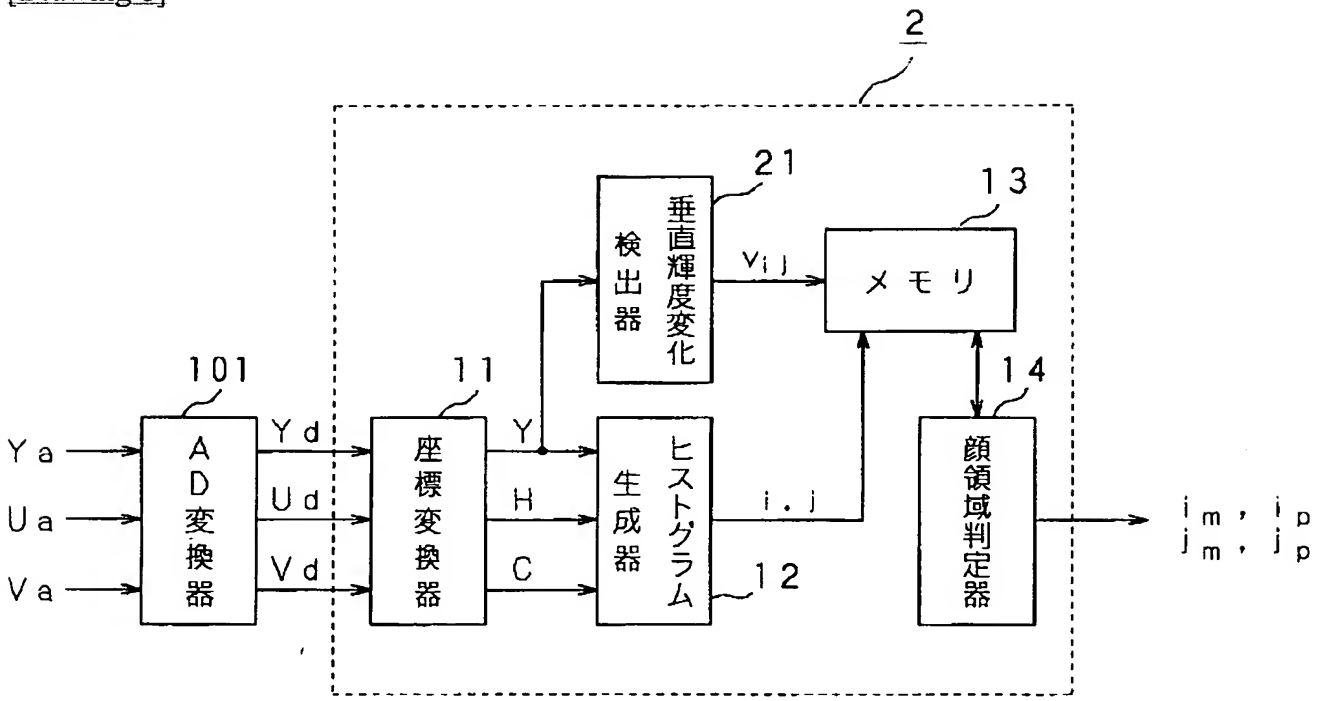
[Drawing 5]



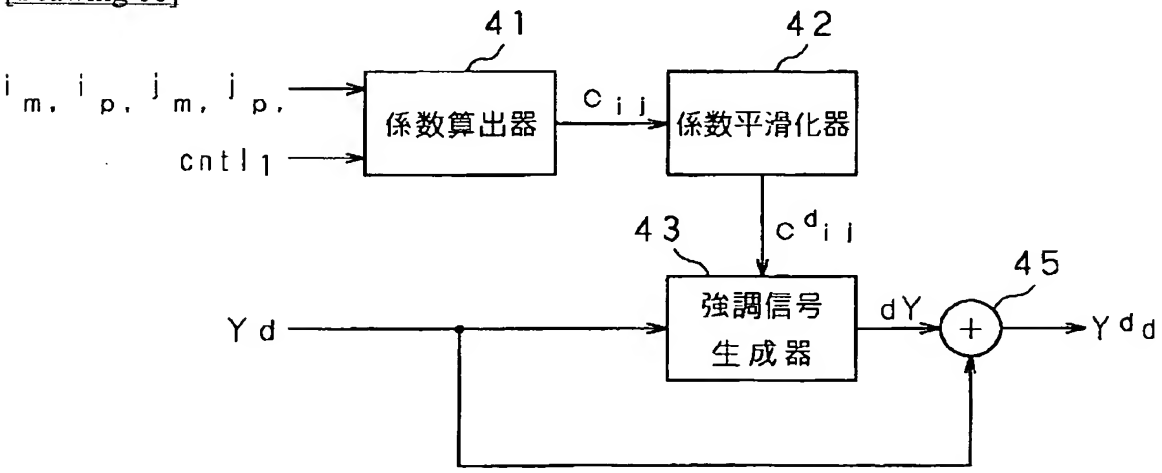
[Drawing 8]



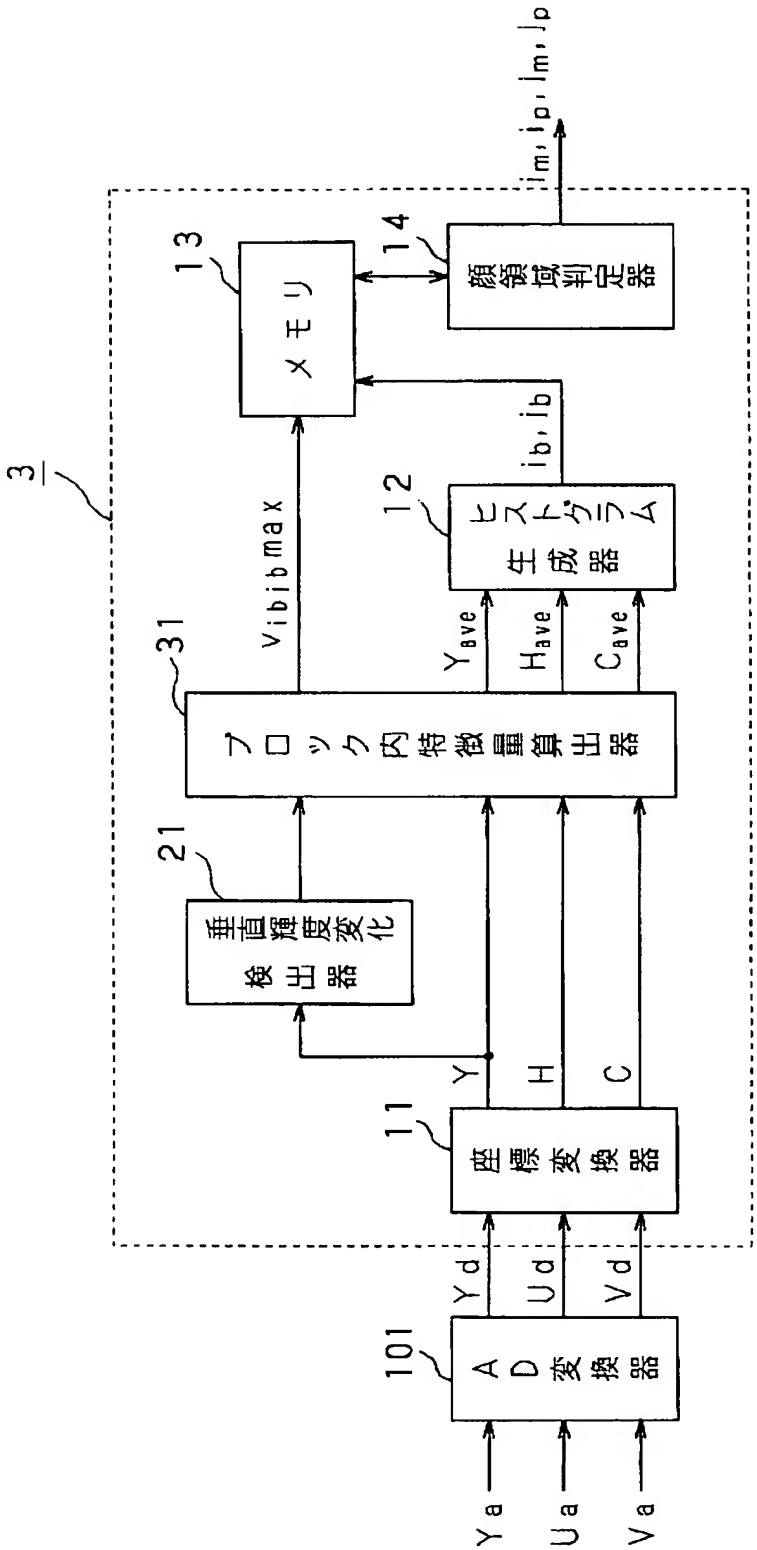
[Drawing 6]



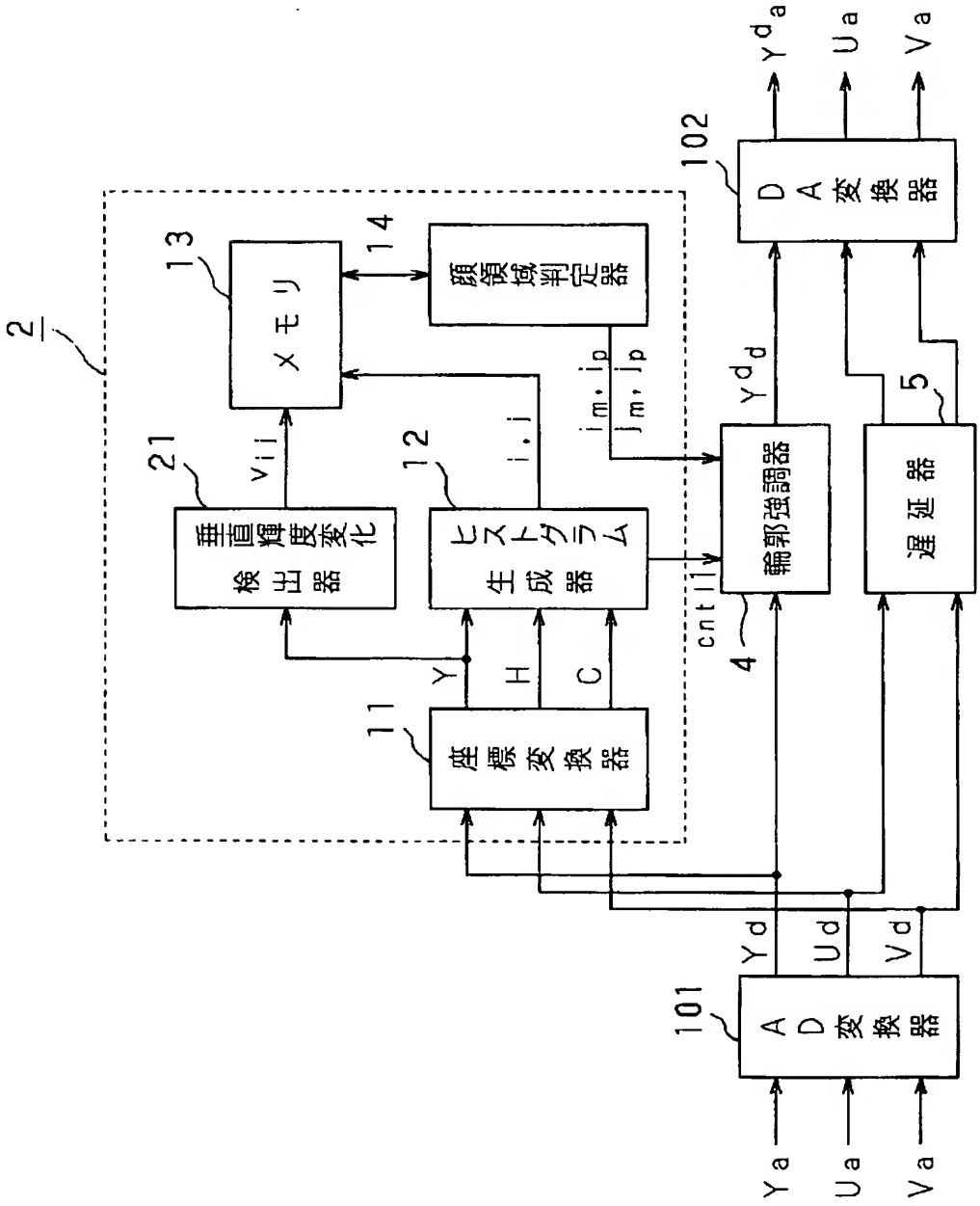
[Drawing 10]



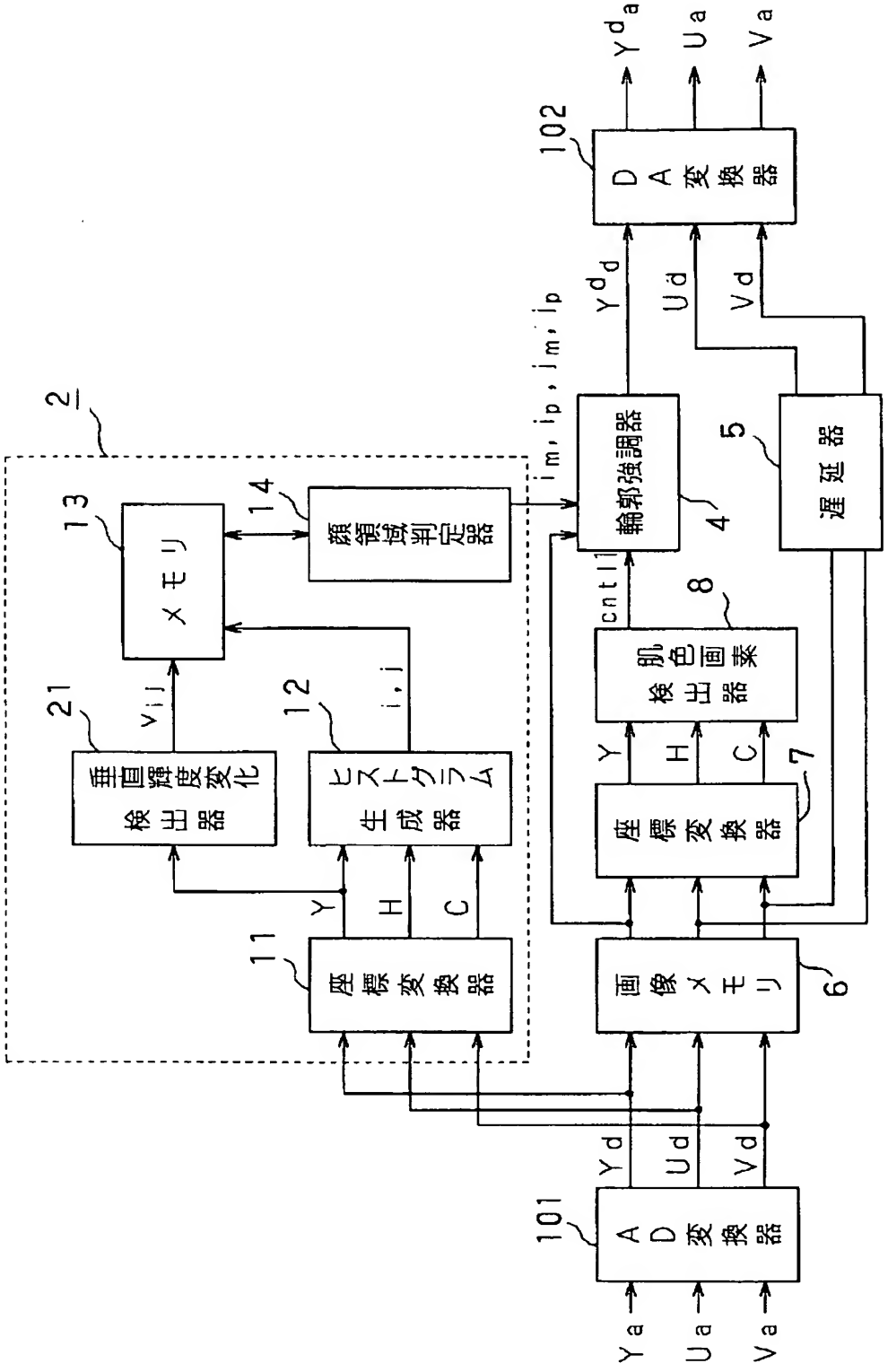
[Drawing 7]


im, ip, lm, lp
3
13
メモリ
14
顔領域判定器
ib, ib
12
ヒストグラム生成器
Vibibmax
Yave
Have
Cave
31
ブロック内特徴量算出器
21
垂直輝度変化検出器
Y
H
C
11
座標変換器
Yd
Ud
Vd
101
AD変換器
Ya
Ua
Va

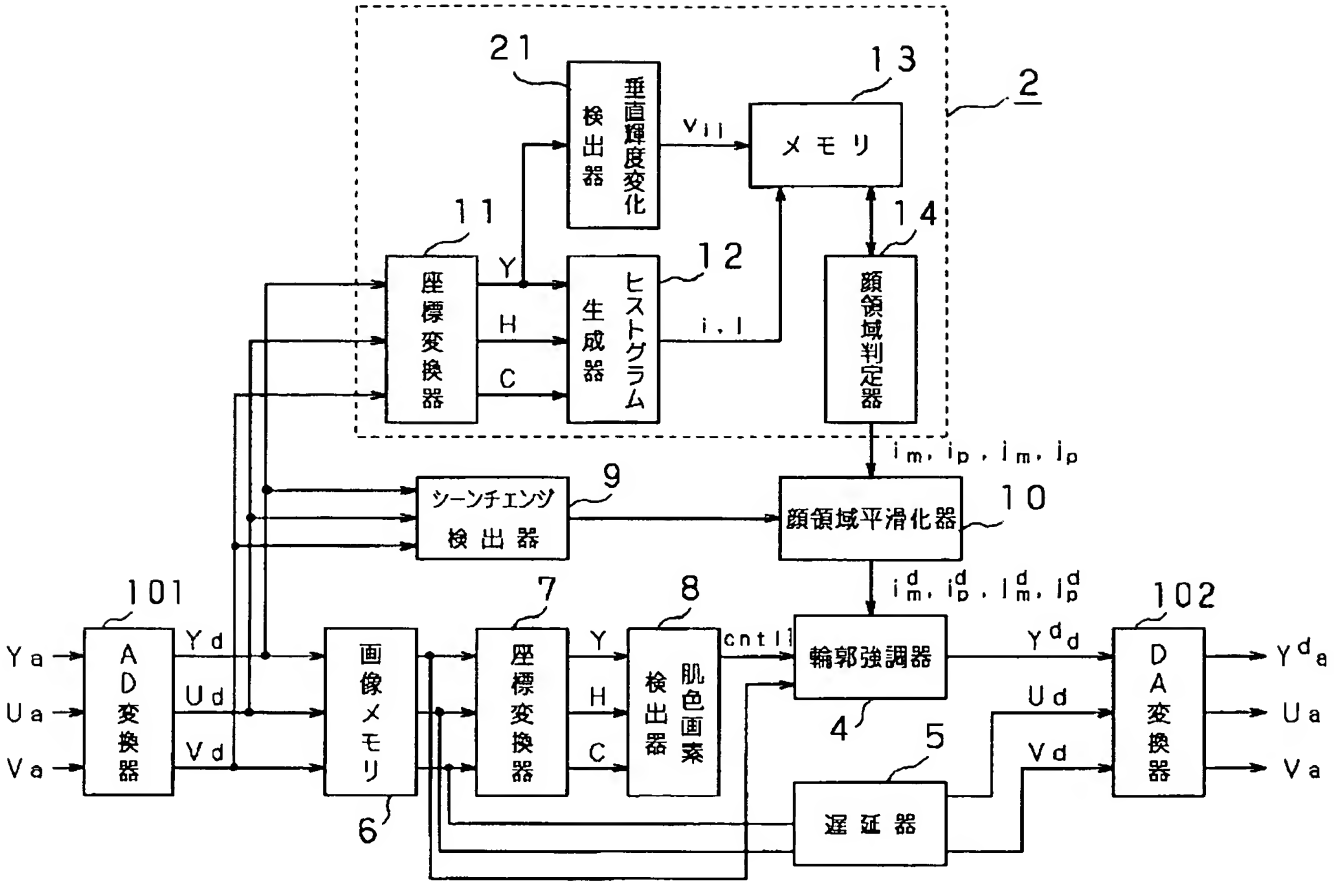
[Drawing 9]


2
13
メモリ
14
顔領域判定器
im, ip
im, jp
21
垂直輝度変化検出器
vii
12
ヒストグラム生成器
i, j
Y
H
C
11
座標変換器
Ydd
輪郭強調器
cntlv
4
5
遅延器
102
DA変換器
Yda
Ua
Va
101
AD変換器
Yd
Ud
Vd
Ya
Ua
Va

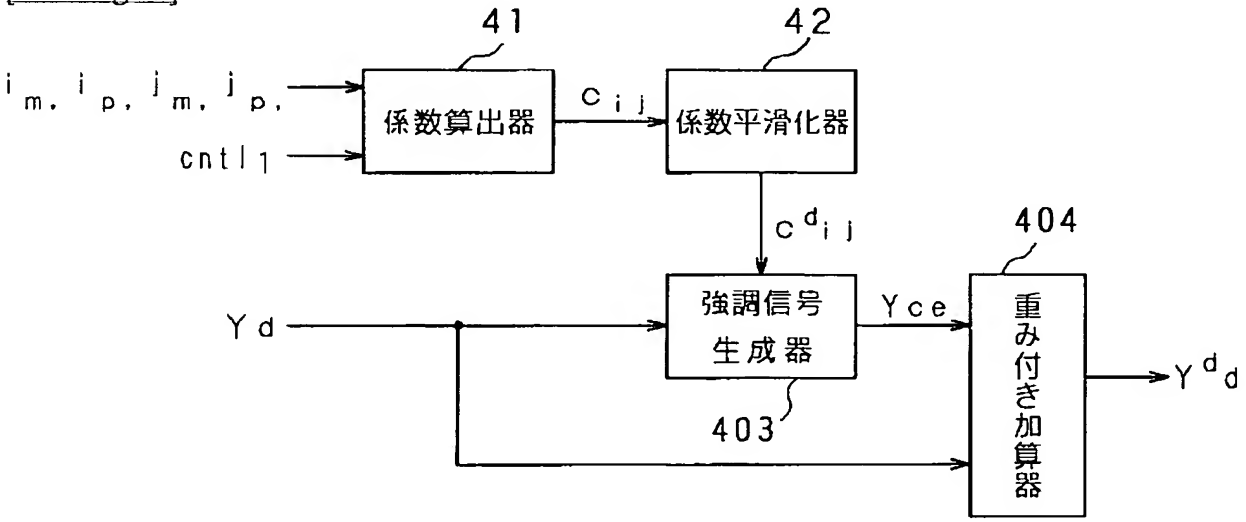
[Drawing 11]


Ya
Ua
Va
101
A D 変換器
Yd
Ud
Vd
画像メモリ
6
座標変換器
7
Y
H
C
肌色画素検出器
8
cntl
輪郭強調器
4
遅延器
5
im, ip, jm, jp
Yda
Ua
Va
102
D A 変換器
Yd
Ud
Vd
2
メモリ
13
類領域判定器
14
垂直濃度変化検出器
21
vij
ヒストグラム生成器
12
i, j
座標変換器
11
Y
H
C

[Drawing 12]



[Drawing 13]



[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Section partition] The 3rd partition of the 6th section
[Publication date] January 25, Heisei 14 (2002. 1.25)

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1/00
H04N 9/64

[FI]

G06F 15/70 310
H04N 9/64 Z
G06F 15/66 310

[Procedure revision]
[Filing Date] June 8, Heisei 13 (2001. 6.8)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] The image processing system which changes into the brightness data and color difference data which are characterized by providing the following, and which digitized the inputted portrait image data, and is equipped with a skin field detection means to detect a skin field, from the digitized brightness data and color difference data The above-mentioned skin field detection means is a conversion means to change the above-mentioned brightness data and color difference data into 3 attribute data of brightness data, hue data, and chroma data. A beige pixel extract means to extract a beige pixel from 3 attribute data obtained by the above-mentioned conversion means A beige pixel distribution generation means to generate spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means A face field judging means to judge the face field of a portrait image by making into a beige field the field where a beige pixel crowds from the beige pixel distribution generated by the above-mentioned beige pixel distribution generation means
[Claim 2] The above-mentioned beige pixel distribution generation means is an image processing system according to claim 1 characterized by generating the beige pixel distribution which is the horizontal beige pixel histogram which accumulated the number of the beige pixels perpendicularly located in a line for every horizontal position of a portrait image.
[Claim 3] It has a perpendicular brightness change detection means to detect brightness change of the perpendicular direction in a beige field from the brightness data obtained by the above-mentioned

conversion means. The above-mentioned beige pixel distribution generation means Brightness change distribution of brightness change of the perpendicular direction in the beige field detected by the above-mentioned perpendicular brightness change detection means while generating spatial beige pixel distribution of the beige pixel extracted by the above-mentioned beige pixel extract means is generated. The above-mentioned face field judging means is an image processing system according to claim 1 characterized by judging the face field of a portrait image from the beige pixel distribution and brightness change distribution which were generated by the above-mentioned beige pixel distribution generation means.
[Claim 4] It has a calculation means within a block to compute the average value for every block which divided into the block 3 attribute data obtained by the above-mentioned conversion means. The above-mentioned beige pixel extract means A beige block is extracted from the average value of each block computed by the above-mentioned calculation means within a block. The above-mentioned beige pixel distribution generation means It is the image processing system according to claim 1 which generates spatial beige block distribution of the beige block extracted by the above-mentioned beige pixel extract means, and is characterized by the above-mentioned face field judging means judging the face field of a portrait image from the beige block distribution generated by the above-mentioned beige pixel distribution generation means.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0013
[Method of Amendment] Deletion
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0014
[Method of Amendment] Deletion
[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0017
[Method of Amendment] Deletion
[Procedure amendment 5]
[Document to be Amended] Specification
[Item(s) to be Amended] 0018
[Method of Amendment] Deletion
[Procedure amendment 6]
[Document to be Amended] Specification
[Item(s) to be Amended] 0019
[Method of Amendment] Deletion
[Procedure amendment 7]
[Document to be Amended] Specification
[Item(s) to be Amended] 0020
[Method of Amendment] Deletion
[Procedure amendment 8]
[Document to be Amended] Specification
[Item(s) to be Amended] 0021
[Method of Amendment] Deletion
[Procedure amendment 9]
[Document to be Amended] Specification
[Item(s) to be Amended] 0022
[Method of Amendment] Deletion
[Procedure amendment 10]
[Document to be Amended] Specification
[Item(s) to be Amended] 0023
[Method of Amendment] Deletion
[Procedure amendment 11]
[Document to be Amended] Specification
[Item(s) to be Amended] 0026
[Method of Amendment] Deletion

[Procedure amendment 12]
[Document to be Amended] Specification
[Item(s) to be Amended] 0027
[Method of Amendment] Deletion
[Procedure amendment 13]
[Document to be Amended] Specification
[Item(s) to be Amended] 0030
[Method of Amendment] Deletion
[Procedure amendment 14]
[Document to be Amended] Specification
[Item(s) to be Amended] 0031
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[Procedure amendment 15]
[Document to be Amended] Specification
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[Procedure amendment 16]
[Document to be Amended] Specification
[Item(s) to be Amended] 0033
[Method of Amendment] Deletion
[Procedure amendment 17]
[Document to be Amended] Specification
[Item(s) to be Amended] 0034
[Method of Amendment] Deletion
[Procedure amendment 18]
[Document to be Amended] Specification
[Item(s) to be Amended] 0035
[Method of Amendment] Deletion
[Procedure amendment 19]
[Document to be Amended] Specification
[Item(s) to be Amended] 0036
[Method of Amendment] Deletion
[Procedure amendment 20]
[Document to be Amended] Specification
[Item(s) to be Amended] 0057
[Method of Amendment] Modification
[Proposed Amendment]
[0057] From the beige pixel histogram SH for one image generated on memory 13 with the above-mentioned histogram generation vessel 12 [i], the face field judging machine 14 detects the field where a beige pixel crowds as a skin field, and judges whether it is a face field based on the ratio of the detected skin area size and die length in every direction. And when the result of a judgment is a face field, the information im and ip on a face field is outputted.
[Procedure amendment 21]
[Document to be Amended] Specification
[Item(s) to be Amended] 0058
[Method of Amendment] Modification
[Proposed Amendment]
[0058] As mentioned above, in this example, the horizontal beige pixel histogram SH [i] is generated. Since the field where a beige pixel crowds based on the above-mentioned beige pixel histogram SH [i] is detected as a skin field and the face field is judged based on the ratio of the detected skin area size and die length in every direction, The analysis of a person's skin field and a person's face field are correctly [at high speed and] detectable.
[Procedure amendment 22]
[Document to be Amended] Specification
[Item(s) to be Amended] 0062
[Method of Amendment] Modification

[Proposed Amendment]
[0062] The beige pixel histogram SH horizontal on memory 13 [i] and the vertical beige pixel histogram SV [j] are generated. Thus, the face field judging machine 14 Based on the beige pixel histogram SH of the above-mentioned horizontal direction [i], and the vertical beige pixel histogram SV [j], it analyzes like the 1st example mentioned above, and the information im and ip on the face field in each direction, and jm and jp are outputted.
[Procedure amendment 23]
[Document to be Amended] Specification
[Item(s) to be Amended] 0080
[Method of Amendment] Modification
[Proposed Amendment]
[0080] On the other hand, the above-mentioned perpendicular brightness change detector 21 generates the horizontal differential histogram DH [i] which accumulated the differential value of the perpendicular direction of the brightness data Y from the above-mentioned coordinate transformation machine 11 for every horizontal location, and the differential histogram DV of the perpendicularly the differential value of the perpendicular direction of the above-mentioned brightness data Y was accumulated for every vertical location [j] on memory 13. From the beige pixel histogram SH [i] generated on memory 13 with the above-mentioned histogram generation vessel 12, and the beige pixel histogram SV [j], the face field judging machine 14 detects the field where a beige pixel crowds as a skin field, and judges whether it is a face field based on the ratio of the detected skin area size and die length in every direction. And when the result of a judgment is a face field, based on the differential histogram DH [i] and the differential histogram DV [j] which were generated on memory 13 by the above-mentioned perpendicular brightness change detector 21, the information im, ip, jm, and jp on a face field is outputted.
[Procedure amendment 24]
[Document to be Amended] Specification
[Item(s) to be Amended] 0081
[Method of Amendment] Modification
[Proposed Amendment]
[0081] Although the information im, ip, and jm on a face field based on distribution of brightness change of the above perpendicular directions and detection of jp are based on horizontal edges, such as an eye and opening, being contained in a person's face, they can avoid incorrect detection of a uniform field with little brightness change like a wall by judging a face field based on distribution of a vertical brightness change. Therefore, the analysis of a person's beige field and a person's face field can be detected more correctly.
[Procedure amendment 25]
[Document to be Amended] Specification
[Item(s) to be Amended] 0095
[Method of Amendment] Modification
[Proposed Amendment]
[0095] The face field judging machine 14 judges whether it is a face field based on the magnitude of the beige block which detected and detected the beige block, and the ratio of die length in every direction like the 2nd example which mentioned above the beige block histogram SV[ib] beige block histogram SV [jb], the differential histogram DH [ib], and the differential histogram DV [jb] of the block unit generated on memory 13. And the center positions im, ip, jm, and jp of the block numbers ibm, ibp, jbm, and jbp of the beige block judged to be a face field
$im=ibm(2mi+1)+mi$
$ip=ibp(2mi+1)+mi$
$jm=jbm(2mj+1)+mj$
$jp=jbp(2mj+1)+mj$
By the becoming operation, it asks, and the center positions im, ip, jm, and jp for which it asked are made into the coordinate which shows the boundary of a face field, and are outputted as information on a face field.
[Procedure amendment 26]
[Document to be Amended] Specification
[Item(s) to be Amended] 0103
[Method of Amendment] Modification
[Proposed Amendment]

[0103] From the beige block histogram SH of the block unit generated on memory 13 [ib], and the beige block histogram SV [jb], the face field judging machine 14 detects the field where flesh color crowds as a skin field, and judges whether it is a face field based on the ratio of the detected skin area size and die length in every direction. And when the result of a judgment is a face field, based on the differential histogram DH of a block unit [ib] and the differential histogram DV [jb] which were generated on memory 13, the information im, ip, jm, and jp on a face field is outputted.
[Procedure amendment 27]
[Document to be Amended] Specification
[Item(s) to be Amended] 0104
[Method of Amendment] Modification
[Proposed Amendment]
[0104] As mentioned above, in this example, an image is divided into a block, and since the face field is detected based on the magnitude of the beige block which detected and detected the beige block based on distribution of the average color within a block, and the ratio of die length in every direction, the analysis of a person's beige field and a person's face field are correctly [at high speed and] detectable.
[Procedure amendment 28]
[Document to be Amended] Specification
[Item(s) to be Amended] 0108
[Method of Amendment] Modification
[Proposed Amendment]
[0108] As the above-mentioned image processing system applies the skin field detection means 2 of the image processing system concerning the 3rd example mentioned above, for example, shows it to drawing 9 The skin field detection means 2 shown in above-mentioned drawing 6, and the profile emphasis machine 4 which performs profile emphasis processing by control based on the information on the face field obtained by the above-mentioned skin field detection means 2, The delay machine 5 for taking the synchronization with the data and the input data which are outputted from the above-mentioned profile emphasis machine 4, A/D converter 101, and a digital to analog converter (it is hereafter called a D/A converter.) It has 102.
[Procedure amendment 29]
[Document to be Amended] Specification
[Item(s) to be Amended] 0158
[Method of Amendment] Modification
[Proposed Amendment]
[0158] The above-mentioned image processing system is added to the configuration of the image processing system concerning the 7th example mentioned above, as shown in drawing 12. The scene change detector 9 which detects the change of a scene from the luminance signal Yd by which digital conversion was carried out with A/D converter 101, and color-difference signals Ud and Vd, It has the face field smoothing machine 10 which performs time data smoothing to the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2 based on the detection result of the above-mentioned scene change detector 9.
[Procedure amendment 30]
[Document to be Amended] Specification
[Item(s) to be Amended] 0175
[Method of Amendment] Modification
[Proposed Amendment]
[0175] The above-mentioned face field smoothing machine 10 supplies the information idm, idp, jdm, and jdp on a face field that graduated the spatial location of the information im, ip, jm, and jp on the face field from the above-mentioned skin field detection means 2 in time, and it was graduated to the profile emphasis machine 4 based on the control signal cntl2 from the above-mentioned scene change detector 9.
[Procedure amendment 31]
[Document to be Amended] Specification
[Item(s) to be Amended] 0191
[Method of Amendment] Modification
[Proposed Amendment]
[0191] As mentioned above, in this example, since weight adjustment is carried out with the smoothing correction factor cdij based on the beige detecting signal cntl1 of the pixel unit of the image under input and gradation modulation processing is performed, the feeling of contrast of an image can be raised by carrying

out gray scale conversion of other fields, without carrying out gray scale conversion of a person's face field.
[Procedure amendment 32]
[Document to be Amended] Specification
[Item(s) to be Amended] 0192
[Method of Amendment] Modification
[Proposed Amendment]
[0192] In addition, although the profile emphasis machine 4 of the image processing system concerning the 5th example mentioned above shall be transposed to a gradation converter in the example mentioned above, it is good also as what transposes the profile emphasis machine 4 of the image processing system concerning the 6th example mentioned above to a gradation converter. In this case, since the information im, ip, jm, and jp on the face field obtained by the skin field detection means 2 is computed from the image which actually performs gradation transform processing, it can make the location of a face field reflect in gradation transform processing more correctly. Therefore, the feeling of contrast of an image can be raised further.
[Procedure amendment 33]
[Document to be Amended] Specification
[Item(s) to be Amended] 0193
[Method of Amendment] Modification
[Proposed Amendment]
[0193] Moreover, it is good also as what transposes the profile emphasis machine 4 of the image processing system concerning the 7th example mentioned above to a gradation converter. In this case, since time fluctuation of the face field in the same scene can be eased, the feeling of contrast of an image can be raised further.
[Procedure amendment 34]
[Document to be Amended] Specification
[Item(s) to be Amended] 0197
[Method of Amendment] Deletion
[Procedure amendment 35]
[Document to be Amended] Specification
[Item(s) to be Amended] 0198
[Method of Amendment] Deletion
[Procedure amendment 36]
[Document to be Amended] Specification
[Item(s) to be Amended] 0201
[Method of Amendment] Deletion
[Procedure amendment 37]
[Document to be Amended] Specification
[Item(s) to be Amended] 0202
[Method of Amendment] Deletion
[Procedure amendment 38]
[Document to be Amended] Specification
[Item(s) to be Amended] 0203
[Method of Amendment] Deletion
[Procedure amendment 39]
[Document to be Amended] Specification
[Item(s) to be Amended] 0204
[Method of Amendment] Deletion
[Procedure amendment 40]
[Document to be Amended] Specification
[Item(s) to be Amended] 0205
[Method of Amendment] Deletion
[Procedure amendment 41]
[Document to be Amended] Specification
[Item(s) to be Amended] 0206
[Method of Amendment] Deletion

[Translation done.]